JULY 18, 1955

NEWS ISSUE

Electrical World

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GENERATION:

Cooling Towers Afford Latitude in Plant Siting and Low-Cost Operation

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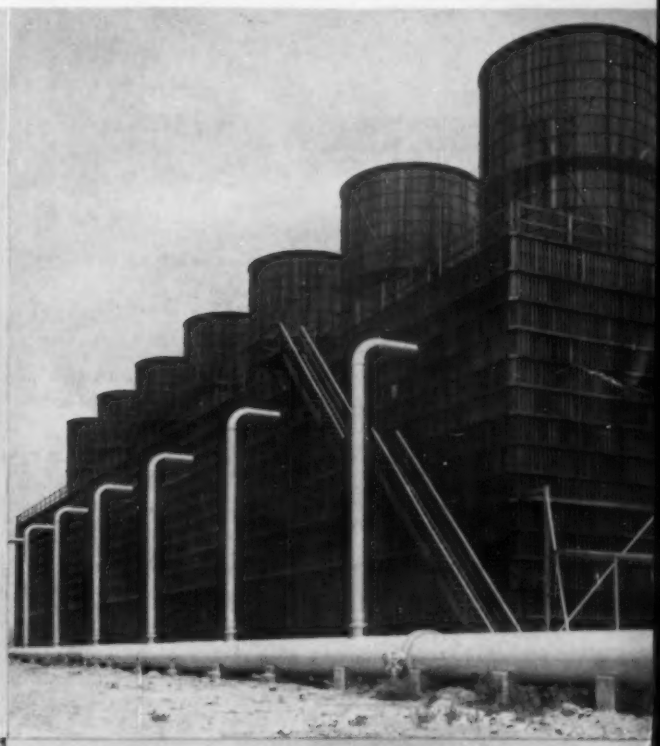

TRANSMISSION:

Mechanized Equipment Clears Right-of-Way

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E B POWER
UNIVERSITY MICROFILMS IN
513 N 1 ST
ANN ARBOR MICH

PLANNING RELAYING SYSTEMS well in advance of present needs permits greatest savings through standardization, typified by luncheon meeting of C. A. Woodrow, Mgr.—Power Transmission Engineering (left), D. B. Brandt, Application Engineer, and L. F. Kennedy, Mgr.—Power Control Engineering.

HOW CAN STANDARDIZATION IMPROVE RELAYING?

CRITICAL SHORTAGE of maintenance and technical manpower has hastened acceptance of standardization with resulting time saving in testing.

IMPROVED RELAY CHARACTERISTICS have made standardization practical, bringing improved system protection at lower cost, exemplified by this 2400-volt metal-clad station switchgear.

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The answer may well be reflected in the trend to standardization in relaying. By selecting an over-all plan of protection for all system components and applying the plan wherever similar components are used, many utilities can now free skilled engineers for other important duties.

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ECONOMICALLY SOUND

More and more, the individual-pattern viewpoint is becoming an expensive luxury, as the standardization of protective relaying becomes economically sound. For more information, contact your G-E Apparatus Sales Representative or write for publication GET-2510 to General Electric Company, Section 301-296, Schenectady 5, New York.

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Electrical World

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COMING NEXT WEEK—A 12-page roundup of the lighting market takes a look at current problems faced and the ways they are being met as lighting captures a new, important place in utility sales planning.

(Advertisement)

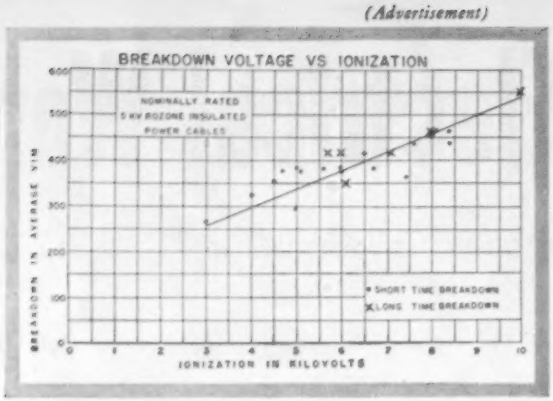


Chart of observed data on breakdown voltage vs. ionization as determined on samples of a rated 5 kv rubber-compound-insulated conductor.

CURRENT TRENDS

No. 2 in a series

Production testing of Corona Level on High-Voltage Cable

Nondestructive testing of cable* is a quality control measure which protects the ultimate user

Whether insulated with rubber or thermoplastic, high-voltage cable must be free of voids and porosity. Otherwise, there may be trouble, if the operating voltage exceeds the corona-forming voltage.

Our job was to provide a test which would insure cable performance in a corona-free condition.

Rome developed and has continuously used a corona-ionization production test procedure since 1947. It is now applied as part of standard testing for all power cable rated 4001 volts and over.

How it's done

The detector is a basic "filter"-type circuit. It consists of an ionization-free, high-voltage transformer with amplifier and detector circuits located in a central control area with other inspection instruments. A corona-free bus-distribution system provides accessible electrical connections to the reels of cable in the test zone.

While bridge circuits have been used for ionization detection, the filter circuit provides more advantages since it involves simpler equipment, it provides for grounded test specimens, is more sensitive, and it can record minimum values of corona level rather than the average value detected by bridge methods.

This test, used on the production line, helps determine the electrical soundness of every foot of cable in every reel. If troublesome voids exist, the detector immediately indicates their presence. If the trouble cannot be remedied, the defective portion of the cable is discarded.

Where trouble occurs

Voids may occur next to the conductor, within the insulation, or beneath the outer shield. Voids are more likely to be found between the insulation and the conductor—and this is the most vulnerable place since it is the area of maximum voltage stress. Proper cable design and correct manufacture are the best assurances for a corona-free cable.

More about testing

The corona-level tests we have been conducting for the past eight years, on all high-voltage rubber- and thermoplastic-insulated power cables consist of measuring the corona level on full reel lengths of cable. This is done before the routine voltage and insulation resistance tests, during which unshielded cables are immersed in water which acts as the ground electrode. Shielded or lead-sheathed cables are tested dry on the floor.

Quality control

As a standard quality control measure, we require that the measured corona level on any high-voltage cable *exceed* the *intended operating voltages* by a predetermined value. This means that the cable should be free of any destructive ionization effects in service. And that's important, because ionization of air in voids between conductor and insulation causes the formation of small quantities of ozone and oxides of nitrogen together with a subsequent reduction in dielectric strength and a rapid physical deterioration of the insulation. With nonozone-resistant rubber insulations you may get corona cutting (similar to sunlight checking).

Testing helps prevent all these possible performance hazards.

The value to you

The real end value of Rome's corona-level testing is its contribution toward production of power cable that assures *you* years of trouble-free service. It is a quality control measure (now getting general industry acceptance) of enormous value to all users of high-voltage cable.

When you buy cable that has been corona-level tested, you derive a certain peace of mind from the knowledge that at least one frequent cause of costly, troublesome service outages has been virtually eliminated. Your maintenance costs go down proportionately. And, indirectly at least, the good will of the people who depend on the power distributed over these lines is enhanced.

If you'd like to know more about Rome Power and Control Cables, a note to us will bring you catalogs, specifications or engineering help.

*"The Measurement and Investigation of Ionization Level of Rubber-Insulated Cables," R. C. Graham, E. K. Duffy, W. P. Foster; Trans. AIEE Technical Paper 48-198; August 24 to 27, 1948.

"Corona-Level Testing of Cables," R. C. Graham; reprinted from Electric Light and Power, May, 1953.

"Corona-Level Measurements as Applied to Rubber and Thermoplastic Insulated Cable," R. C. Graham; program Twenty-Second Annual Conference of Doble Clients; January 24 to 28, 1955.

ROME CABLE CORPORATION, Rome, New York

Who Won On Dixon-Yates?

President Eisenhower has decided to cancel the so-called Dixon-Yates contract, but only on his own terms. For him and his Republican cohorts in Congress, the outcome of the 18-month controversy centering around the Dixon-Yates power contract must be reckoned an unusual victory. Federal power advocates who opposed the contract will long ponder their actions leading up to cancellation for they will find they have ended up in defeating their own purposes.

By every criterion, the arrangements under which the City of Memphis proposes to meet its own power needs conform to the tenets of federal Republican power policy. The goal of this policy is to shift electric utility responsibility from the federal government back to local interests. In some respects the present arrangements better serve Republican power policy than would the Dixon-Yates contract. One result of the contract would have been to further underwrite the utility responsibility of Tennessee Valley Authority, a federal agency.

This victory for the Republican Administration is shared by others for whom the policy was written.

The City of Memphis accepts sole responsibility for its own power needs and thus becomes independent of TVA. The White House had suggested this step earlier but only recently became convinced that the City was willing and able to go ahead with it. It will no longer have to look to Washington for funds to insure electrical power for future industrial expansion. It may be a partner, but will no longer be a subject of TVA.

Federal taxpayers win relief from supplying the funds for further TVA expansion in the Memphis area. Instead the money will be raised by the area which uses the power facilities.

While cancellation of the Dixon-Yates contract must be counted as an immediate setback for electric companies since it means a shift from a privately-owned to publicly-owned plant, there may be long-term gains. In eliminating federal power expansion in this crucial area, the Administration has made an admirable stride in restoring electric utility responsibility to local areas. The action offers a significant precedent against the further encroachment of federal power.

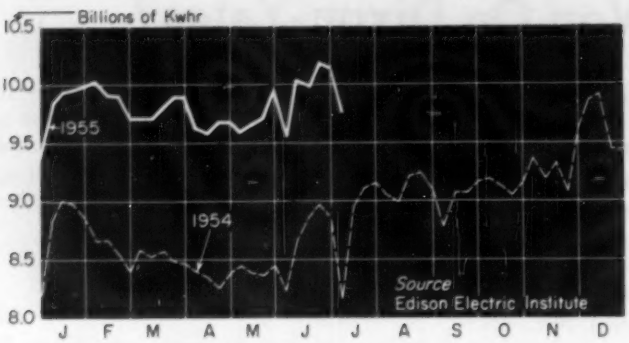
But in any victory of this magnitude, there must be losers, too.

Among them in this instance are Edgar Dixon, president, Middle South Utilities, Inc, and Eugene A. Yates, chairman of The Southern Co. These men met the challenge of the Administration to supply power in a crucial area at a critical moment. They and their aides deserve the gratitude of the American people and the electric industry for organizing the Mississippi Valley Generating Co geared to perform a tremendous job in electric power generation. It is these men who have borne the brunt of the vicious political attack made on the contract. Their expenditures of time and effort will not be fully compensated by the cancellation provisions of the contract. Their real compensation must come from the contribution which they have made in furthering a power policy designed to serve the broad public interest.

Of course the big-time losers in the long controversy are the New-Dealing federal power proponents whose spokesmen are Democratic Senators Estes Kefauver and Albert Gore of Tennessee and Clinton Anderson of New Mexico. It was clear from the beginning that Kefauver and Gore were out to obtain federal funds for further TVA expansion. They attempted to cast their own regional problem in terms of a national issue.

When the City of Memphis came up with a proposal acceptable to the White House and many in the Congress, Kefauver and Gore and their like-minded colleagues had to salvage what they could. The best they could do was to charge there was something wrong with the contract, for they must admit they have failed to gain the federal funds they sought. Instead of expanding the federal power domain, they have aided in curtailing it.

ELECTRICAL WEEK



OUTPUT

Week Ended July 9

9,759,000,000 Kwhr

Up 19.2%

Atomic Energy Commission requirements — 875,000,000 kwhr (Electrical World estimate). Excluding AEC, output increase was 13.5%

Per Cent Change From Previous Year

	Total US	New Eng.	Mid. Atlan.	Cent. Ind.	West Cent.	South-east	South Cent.	Rocky Mount.	Pacific NW	Pacific SW
July 9	+19.2	+15.0	+19.2	+34.8	+6.9	+25.3	+5.8	+7.8	+13.2	+4.8
July 2	+14.9	+10.5	+11.1	+22.8	+0.9	+20.5	+5.2	+11.4	+13.4	+6.8
June 25	+13.9	+7.8	+11.3	+20.5	−0.6	+21.8	+0.6	+8.6	+13.3	+6.4

Seasonally Adjusted Index 193.0 Week Ago 193.9 Year Ago 172.1

The Issue's Highlights: President Eisenhower cancels Dixon-Yates contract after Memphis' Mayor Tobey gives personal assurance that city will build own plant . . . Kefauver says he will continue probe of contract; grills Wenzell at length on his role . . . AEC issues safety regulations for private atom users . . . Guaranteed annual wage demands come to electrical manufacturing industry this week in GE wage negotiations . . . Con Edison is kept busy when "heat storm" hits Brooklyn. Elsewhere, repercussions of last summer's heat storm are still being felt. Oklahoma G&E has modified its statistical method of checking transformer loading because rapid summer load increases are not reflected quickly enough (p 27) . . . Hot weather also is focusing attention on cable cooling as heat takes its toll (p 24).

Boston Edison will spend over $1 million this year on modernization of its utility vehicle fleet. Latest purchase in program covers 22 line trucks with hydraulic derricks 24-ft long, 8,000-lb lifting capacity at full extension, and capacity to handle 55-ft poles.

Tacoma, Wash., City Council has approved sale of $15-million revenue bond issue to finance its proposed Mayfield hydroelectric project. City is confident that courts will deny injunction petitioned by fish and game interests against construction of the project. Provisions of sale call for delivery of bonds by July 21.

Illinois state legislature has passed bill authorizing municipalities to levy tax on utilities not to exceed 5% of gross revenue. At same time, bill authorizes utilities to add tax to customers' bills plus an amount not to exceed 3% of the amount of the tax to pay accounting and collecting costs.

Rates: Virginia E&P will seek State Corporation Commission approval to introduce new optional and lower electric rate for small commercial customers. Vepco Pres Jack G. Holtzclaw says reductions will run from 1 to 10% . . . Arkansas P&L, by not appealing a PSC denial of its application, has passed up its last opportunity to put into effect under bond a proposed fuel adjustment clause for certain customers, including co-ops. Company can still request PSC hearing on the application . . . Indiana PSC will begin hearings Aug. 1 on rate increase request by Public Service of Indiana.

Labor: Square D Co and UE-Ind, which staged one of most violent strikes in recent Detroit labor history last year, have quietly agreed on pay increases ranging from 6¢ to 16¢ an hour . . . Ohio Power and UWUA-CIO have agreed on 3¼% wage increase . . . Long Island Lighting and IBEW-AFL have agreed on 3½% wage increase.

NEWS OF THE INDUSTRY BRIEFLY TOLD

Off the Washington Wire: Kefauver ran into snag in his antitrust subcommittee hearings on Dixon-Yates contract when SEC Chairman J. Sinclair Armstrong refused to disclose the role, if any, of the White House in the SEC actions. Armstrong referred to a Presidential order barring disclosure of confidential discussions within the government . . . Democrats on Capitol Hill now are trying to find a way to stop any liberal cancellation settlement with Dixon-Yates group . . . Hearings on four bills for federal construction of a high dam at Hells Canyon got under way before House Interior Committee last week. Opening day hearings were limited to technical witnesses.

AEC has announced that 10,000-kw of interruptible power from GE-built submarine reactor at West Milton, N. Y., will be sold to Niagara Mohawk Power at 3 mills per kwhr unless three nearby public power organizations can make arrangements to transmit it to their systems within three months . . . Forty witnesses are scheduled for Senate hearings on Niagara River power legislation . . . House Chudoff subcommittee has disclosed it has investigators in Southwest looking into SWPA contracts with co-ops and electric companies . . . House has passed and sent to President legislation providing for air pollution research program.

Idaho Power has been placed in better position to fight "public power socialism" at Hells Canyon, according to Utah P&L Chairman George M. Gadsby. Position has come about, he points out, by completion of UP&L's third 100,000-kw unit at Salt Lake City. Idaho Power has first call on this unit for next 16 months and thus will be assured of adequate power.

Atomic Power: Ten-man insurance industry committee appointed by AEC to investigate atomic insurance problems has completed its preliminary report to the AEC. Insurance industry, says report, has adequate capacity to protect companies against physical hazards of atomic reactor plants. But it notes that "catastrophe potential although remote, is more serious than anything now known in industry." Report makes no recommendation for government sharing of insurance burden . . . Illinois has created commission to study "economic and social" impact of atomic power on state . . . United States, Canada, Britain, France, Belgium, Portugal, Australia, and New Zealand are working to set up free world atomic energy agency outside of United Nations.

ABOUT PEOPLE IN THE INDUSTRY

Cancellation of Dixon-Yates contract may have placated some but others will long remember, including many from Arkansas. Sen William J. Fulbright (D-Ark.), who backed contract, said cancellation was "a very great blow" to state. "We thought we were supporting the President's considered policy, but we'll know better next time." President's was a "very improvident kind of policy in letting me and my colleagues and people in the business world get as far out on a limb as he did and then back off."

U. N.'s atoms-for-peace conference in Geneva next month will find all nations, including U. S. and Soviet Russia, taking wraps off a good deal of nuclear reactor information which until now has been considered top secret, according to Dr. Walter G. Whitman, secretary-general of conference. Whitman, on leave from M. I. T., and his staff in New York have examined 1,084 papers which will be presented there. He sees stage coming in not too distant future "where power reactors will be completely declassified."

More News About People page 36

Ike Cancels Dixon-Yates Contract

- **Mayor Tobey gives personal assurance that Memphis will supply own power**
- **Details awaited on how city will finance and construct its proposed plant**

Cancellation of the Dixon-Yates contract was ordered last week by President Eisenhower, immediately after he received personal assurances from Memphis' Mayor Frank Tobey that the city's plans for the new plant were firm.

With cancellation assured, Memphis city officials pressed harder their plans to build a new 350,000-400,000-kw steam plant to take the place of the abandoned private project.

Eisenhower's order came in typical style. It was disclosed by Attorney General Herbert Brownell, who had accompanied Tobey to the White House, and it resembled the President's surprise order of a week before for a restudy of the contract.

The order leaves a number of questions unanswered:

- What will be the extent of financial penalties incurred by the government in canceling the contract?
- How much power will be delivered by the new Memphis plant, and will it stand alone, operated as an independent facility by the city, or be integrated into the TVA system?
- How the Memphis plant will be financed?
- Why, exactly, Memphis decided to let its contract with TVA expire without renewal in 1958 and to build its own plant instead?
- Whether Dixon-Yates will go ahead and build a plant at West Memphis, Ark., and how big it will be, if they do?

Taking these unknowns in order, here's what the situation looks like:

Cancellation Penalties: Right after the White House announcement, negotiations began between federal officials and Edgar Dixon, president of the power firm. Dixon said the government must pay "several millions" for expenses incurred so far under the contract. He claimed the contract "valid and binding" and points out that his company has gone forward with the project even during the hottest days of the controversy. Brownell said the Justice Department will handle cancellation negotiations, but had no idea of what penalties would be. Atomic Energy Commission Chairman Lewis Strauss, whose agency signed the contract, met with Dixon to talk this over beginning preliminary discussions of termination terms.

IKE AND TOBEY: A load off their minds.

Memphis Plant Integration: Memphis representatives in Washington say the city plans a 350,000-400,000-kw, four-unit plant. Memphis' estimated 1958 peak is 475,000 kw. Before Tobey made a promise to the President to operate the plant independently, without integrating it with the TVA system, these spokesmen had flatly said that the new plant would become a part of the TVA grid in short order. They were somewhat confused by Tobey's commitment, and made no bones about it.

Before his talk with Brownell and the President, Tobey had said he would refuse to give any assurance that Memphis would stand alone, building its own plant and operating it without any connection with TVA. However, after the White House conference —and just before Brownell announced the decision to cancel Dixon-Yates— Tobey revealed Memphis would not "insist" on integrating with TVA.

Memphis Plant Financing: Tobey said Memphis expects to commit about $5 million within 30 days in the form of contracts for engineering and planning of the new steam plant. He expects the plant to cost $100 million, to be obtained through issuance of revenue bonds not requiring approval of the voting public in Memphis.

Thus, Memphis plans to move ahead on its own. But both TVA and Memphis would rather have TVA do the job—that's been their objective.

This could be done when TVA gets bond-issuing authority of its own. Hearings have just started in the House of Representatives on two bills to give TVA the right to finance its future construction program through revenue bond issues.

Memphis-TVA Contract: Memphis officials have indicated their decision to let the city's contract with TVA expire in 1958 was based in turn on their decision to build their own plant, rather than take power from the Dixon-Yates facility. Tobey has also made statements indicating that drafts of a new TVA contract were undesirable from several standpoi.ts.

He said, for instance, that Memphis feared TVA would not continue to charge only 4 mills for power delivered to Memphis, when that power included 5.75-mill power from the Dixon-Yates plant. To back up his argument, he said TVA this time offered only a 10-year contract, rather than the 20-year type now in existence. He also claimed TVA wanted to limit Memphis' supply of TVA-generated power for local industry to 15,000 kw per customer. Tobey said Memphis has been hit in the past with requests from firms wanting to use more than this amount.

Across the river in West Memphis, Ark., however, there was another theory. W. K. Ingram, president of the West Memphis Chamber of Commerce, attended a luncheon in Memphis proper and made this charge: Memphis had refused to renew its contract with TVA because the valley authority had insisted that Memphis quit putting a 15% surcharge on power rates of business and industrial firms. He said the surcharge gives Memphis an extra $1.5 million a year which no other city in the state gets because none of the rest has similar arrangements with its business customers. Ingram carried what he said was a copy of the proposed TVA-Memphis contract.

Dixon-Yates Future: At a press conference, Edgar Dixon did not preclude the possibility of building a plant at the Arkansas site. But he added, "There are a thousand things . . . to be considered."

Some of these points are financial. All are political. That's the factor which has characterized the contract since it was made public over a year ago. It has become perhaps the biggest political liability the Republican administration incurred in the last two years.

The political fight's not over yet.

Democrats are already claiming the administration backed down on the deal because the White House was afraid probers would develop a tie-in between government officials and Wall Street. They say they'll continue to press their investigations because they're convinced such a tie-in existed.

Republican supporters of the Administration claim the outcome fits in with the President's program, and that, if Memphis had taken its action two years ago, there never would have been a Dixon-Yates hassle.

Wenzell testifies that he was only a financial adviser as . . .

Kefauver Probes Dixon-Yates

Sen Estes Kefauver (D-Tenn.) and his pro-Tennessee Valley Authority colleagues, promising to keep the Dixon-Yates issue alive for sometime, again grilled former First Boston Corp Vice President Adolphe H. Wenzell. Questioning concerned the part Wenzell had played in decisions leading to the controversial contract.

Wenzell, now assistant to the director of technical operations for the World Bank, has freely admitted that he attended Washington conferences at which the Dixon-Yates proposal was discussed. But he has testified that his role in these talks was limited strictly to financial aspects of a proposal which, at that point, was only one possible solution, among many, to the problem of providing more power in the TVA area.

In fact, Wenzell's testimony showed, he had already suggested several solutions to the government, although he did favor one. The Dixon-Yates proposal was an outgrowth of this. Wenzell said that he had not played any part in connecting the two.

Testimony brought out that Wenzell's recommendations were contained in a report he submitted at the request of Joseph Dodge, then director of the Budget Bureau.

The banker said he came to Washington when his boss, George D. Woods, chairman of the First Boston board, mentioned that Dodge had requested aid in studying the power situation.

Wenzell's report, submitted to the Budget Bureau in Sept., 1953, was characterized by Kefauver and other subcommittee Democrats as the germ of the power policy adopted by Eisenhower three months later.

Because of the problems involved in other considered plans for supplying power to the TVA area Wenzell proposed the following:

"Continue the TVA in its flood control and navigation activity by retaining TVA ownership and control of all the multiple-use dams in order to realize the primary objectives of flood control and navigation. Transfer the balance of the power system assets to a fully taxpaying corporation, the entire capitalization of which in the first instance would be owned by the federal government.

"Have the new corporation purchase at the busbars the entire output of multiple-use dams at a price formula which would include local taxes, interest at a rate equivalent to cost of long-term government money, and amortization over a period of 40 years.

"All future capital requirements for continuous expansion would be obtained through the sale to the public of regular corporate security issues but without any government guarantee, direct or implied."

Senator Kefauver announced that his partisan investigation of the Dixon-Yates contract would continue in his subcommittee.

Controversy Rages in Dixon-Yates Plant Area

• Ire in Arkansas

The Dixon-Yates contract was killed last week by the White House cancellation announcement, but area bitterness which had mounted during the project's stormy history was still very much alive.

While the President considered cancellation, representatives of 30 east Arkansas communities threatened to "terminate the happy relations" with Memphis if their neighbors across the Mississippi did not stop fighting the Dixon-Yates contract.

Arkansas' Gov Orval S. Faubus joined with his political opponent of last summer, former Gov Francis Cherry, in supporting the stand of the communities against Memphis.

"We have been a part of the Memphis trade territory and have been your customers," the delegates said in a resolution addressed to the city across the Mississippi River from West Memphis. "Our relations have been pleasant and mutually beneficial through many years.

"The actions of your city officials and newspapers, their unfair attack on the State of Arkansas, their selfish and deliberate distortion of facts in this matter, are to blame for this unhappy situation."

It said that "the actions . . . if continued, leave no alternative other than to terminate the happy relations . . ."

The resolution adopted was a revision of an earlier one which was rejected as being too mild. Former Governor Cherry said the first resolution gave the "impression we are sorry we are mad at them. I'm not sorry we are mad at them."

Memphis' decision to build its own power plant rather than to buy power from the privately constructed Dixon-Yates plant prompted President Eisenhower to call for a restudy of the need for the Dixon-Yates project.

In a telegram to Mr. Eisenhower, Governor Faubus said the President's "indecision regarding construction (of the Dixon-Yates plant) is in high disfavor with this area."

Stopping construction of the plant now, Faubus told the President, would be "an admission that your administration is guilty of all the charges of error, bad judgment, neglect, and conniving with special interests that have been hurled by the opposition to this project. The plant must now be constructed or your Administration will be adjudged guilty of gross error, bad faith, and bad judgment."

"We urge completion of the plant, regardless of the attitude of Memphis," the Arkansas governor said. "Continued development of this area will assure a market for the power."

The resolution said that Memphis city officials "now want good relations to cease" between the cotton-rich east Arkansas area and Memphis.

"We have treasured our relationship through the years . . . and the people of eastern Arkansas want that relationship to continue for our mutual advantage, but the action of your city officials is making that impossible," the resolution declared.

• Dissension in Memphis

While east Arkansas assailed Memphis as a "bad neighbor," Watkins Overton, former Mayor of Memphis for 16 years, added to the rumpus by sharply criticizing the city's decision to build a municipal power plant.

Overton, a potential November candidate against Mayor Frank Tobey, said, "Now that we have cast TVA aside, we are told we are going to have a $100-million power plant." The former mayor stormed, "When, where, and how—we don't know. What its actual cost will be, we don't know. One thing we do know—it is not the Mayor or the city officials who will pay for it—the people of Memphis will pay for it."

Heat Storm Hits Brooklyn

Consolidated Edison Co of N. Y. had its share of trouble Friday, July 8, in the course of a heat spell that had hovered over the Atlantic Coast for more than a week.

Trouble stemmed from 27-kv underground cables fanning out from the company's Hudson Avenue generating station to serve the western half of Brooklyn. These cables are the solid type, three-conductor, 27-kv, shielded, paper-insulated and lead-covered. Six of the eight cables had burn-outs.

Two of the faults were attributed to corrosion of the lead sheath and consequent moisture absorption by the insulation. Brittle and desaturated tapes were found on the other four cables. This was considered as an indication of high cable temperature but at this writing the cause of the high temperature has not been determined. One possible cause of the trouble was the week-long hot weather preceding the failures and the consequent increase in fan and air conditioning load.

There was no definite pattern apparent in the failures except that most of them occurred fairly close to the station end of the cable. In some cases the burn-out was localized while in others it covered an appreciable area. Some of the faults occurred in manholes while others were in the cable ducts. This series of failures threatened the supply to the network in the west Brooklyn area, serving 1.5-million people.

Two cable failures, one Wednesday and a second early Thursday morning, gave little warning of what was to come. But on Thursday evening three more failures occurred. And another feeder burned out on Friday.

This left a portion of the network with half of its feeders and half of its transformer capacity out of service. There are only a few industrial customers connected to this part of the network.

Thursday evening, when the extent of the damage was determined, Con Edison representatives took to the field, covering the affected area block by block and requesting customers to reduce their loads.

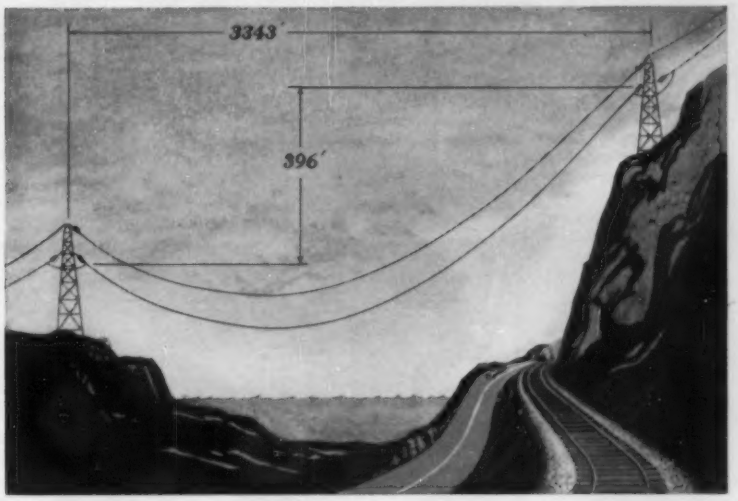
Brooklynites awoke to hear radio and television newscasters asking them to cut back on their non-essential use of power. Early editions of afternoon newspapers repeated the plea in front-page news stories.

The two feeders which failed Wednesday and early Thursday were restored to service early Friday morning.

Shortly after 3 pm, the situation was declared normal again and the company took to the airwaves and the news columns to thank Brooklynites for their cooperation.

How Kaiser Aluminum engineers helped Metropolitan Edison solve construction problems

A. C. LETTS (right), well-known Kaiser Aluminum construction specialist, tells how Kaiser Aluminum engineers worked with the Metropolitan Edison Company during the construction of a key transmission line involving a major Susquehanna River crossing.



"THIS IS ANOTHER INSTANCE where ACSR (Aluminum Conductor Steel Reinforced) proved its superiority in the transmission field. It is 104.84 miles of 230 KV transmission line crossing rough mountainous country with three intermediate substations plus a river crossing requiring a level ground span of 3343 feet with a difference in conductor attachment elevation of 395.69 feet. The span is one of the longest river crossings east of the Mississippi River. (See above.)

"The Metropolitan Edison line in addition to the river crossing consists of a single circuit of 27.44 miles of 795,000 CM—30/19 ACSR and 76.77 miles of 1,033,500 CM—54/7 ACSR with an average span of 1100 feet between steel towers. The ACSR phase conductors were arranged in horizontal configuration with two 7/16" EHS steel shield wires located 20 to 25 feet above the conductors depending upon the structure design to give a shielding angle of approximately 30 degrees.

"Ball and socket type 10" diameter insulators were used, with suspension string insulator assemblies consisting of 16 insulators. Dead-end strain assemblies consisted of double strings of 18 units. Armor rods were used at all points of suspension.

Kaiser Aluminum Recommendations

"Much of the conductor loading and sag-and-tension data was supplied by the engineering department of Kaiser Aluminum for the ruling spans selected by Metropolitan Edison Company engineers.

"The reels were set up on the low side of the Susquehanna River and the conductor pulled above the water and up the mountainside in one continuous operation. By the strategic use of rider poles, the operation of roads, railroads, and energized lines was not hampered during conductor installation."

Our unsurpassed services available to you!

You can take full advantage of Kaiser Aluminum services now—as hundreds of power companies are doing.

Our engineers will personally work with you in the planning and design of overhead lines, furnish technical information, help keep you up-to-date on latest construction techniques, help solve specific installation problems, and assist you in selecting proper accessories and fittings.

In addition, experienced Kaiser Aluminum construction specialists will work with your crews right in the field, demonstrate ways to speed installations and cut costs.

You make big savings with Kaiser Aluminum conductor!

By converting to Kaiser Aluminum conductor you can save thousands of dollars a year! Check the chart below for typical aluminum and copper cost comparisons.

Compare your savings—Kaiser Aluminum vs. Copper Weatherproof Conductors:

	Per 1000 Ft. Lbs.	Cost
#6 Solid Copper TBWP*	112	$ 50.21
#4 Solid Alum PE (2/64)	48	26.90
#4 Solid Alum Neo (3/64)	64	26.90
#2 7 Strand Copper TBWP*	270	126.18
1/0 7 Strand Alum PE (4/64)	141	70.60
1/0 7 Strand Alum Neo (4/64)	172	70.60
2/0 7 Strand Copper TBWP*	522	223.31
4/0 7 Strand Alum PE (4/64)	261	138.00
4/0 7 Strand Alum Neo (4/64)	306	138.00
4/0 7 Strand Copper TBWP*	800	340.64
336400 CM, 19 Str. Alum PE (4/64)	388	216.00
336400 CM, 19 Str. Alum Neo (5/64)	469	231.00

June 1, 1955 prices based on 30,000# — F.O.B. Destination
*URC Copper Triple Braid Weatherproof

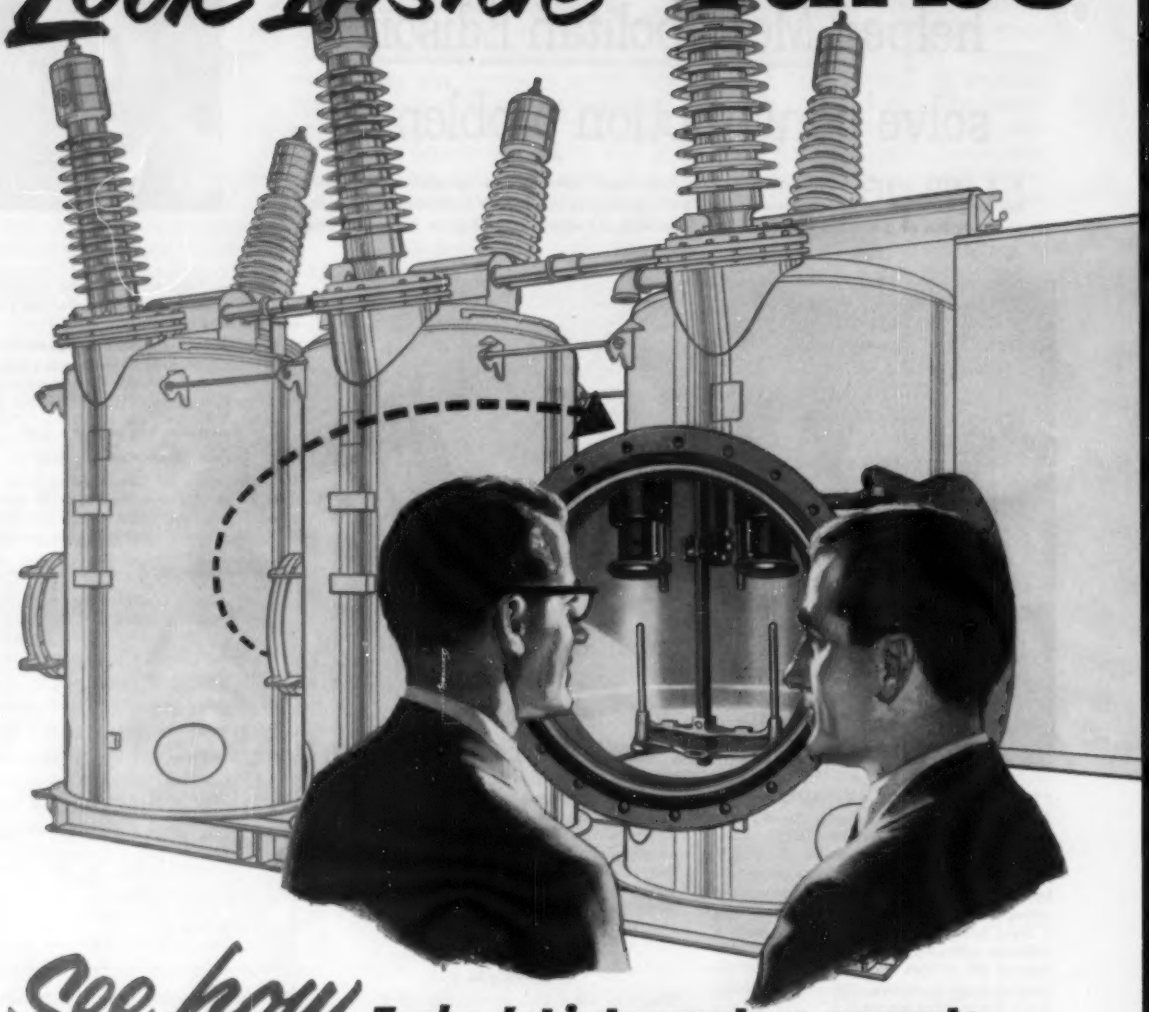
For complete information contact any Kaiser Aluminum office in principal cities or one of our many distributors. Kaiser Aluminum & Chemical Sales, Inc. *General Sales Office*, Palmolive Bldg., Chicago 11, Ill.; *Executive Office*, Kaiser Bldg., Oakland 12, California.

Kaiser Aluminum

THE NATION'S LARGEST PRODUCER OF TRIPLEX AND ALUMINUM WEATHERPROOF CONDUCTOR

Polyethylene & Neoprene Covered Conductor • ACSR Triplex • Quadruplex • All aluminum conductor Rectangular, Solid Round and Tubular Bus

Look Inside "Turbo



See how *Turbo Jet* interrupters operate on Allis-Chalmers high capacity breakers.

Check the picture story on the next page. We think you'll agree the *Turbo Jet* interrupter is surprisingly simple considering the job it must do.

It's designed for fast interruption — whether on high current faults or low current switching! It meets both these extremes — and everything in between.

This device has been tested from the low values of line switching to more than 10,000,000 kva in a combination of field and laboratory tests.

It is but one feature of the Allis-Chalmers line of large power oil circuit breakers.

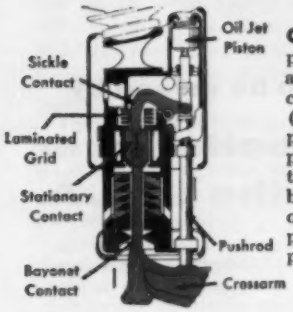
For complete information on these modern oil circuit breakers, call your nearby A-C office, or write Allis-Chalmers, Milwaukee 1, Wisconsin.

For Progress in Switchgear

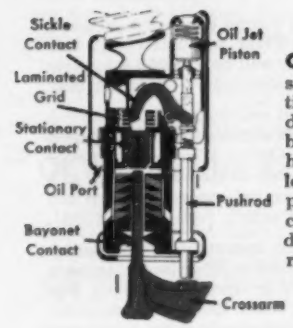
ALLIS-

Jet" Interrupter

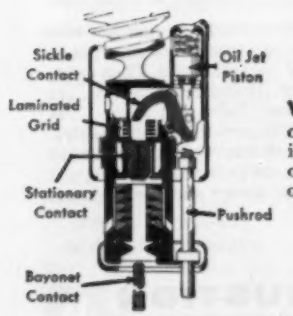
Mechanical Action of *Turbo Jet* Interrupter



Closing: (1) As crossarm pushes bayonet upward it also lifts pushrod, holding it in compression against springs. (2) Sickle contact, linked to pushrod, moves into closed position. (3) Pushrod simultaneously lifts piston assembly against spring—to charge oil jet piston assembly. Note; piston assembly rides on pushrod—is not linked to it.

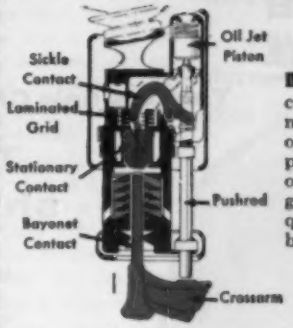


Opening: Bayonet and sickle contacts open at same time. (1) Accelerating springs drive bayonet down to open bayonet contact. (2) Pushrod, held up by crossarm, is released. Pushrod springs force pushrod down, opening sickle contact. (3) At same time downward movement of pushrod triggers oil jet piston.

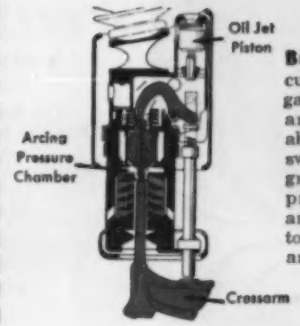


Wide Open: Bayonet is completely withdrawn from interrupting device. A stop on the pushrod limits travel of pushrod and sickle contact.

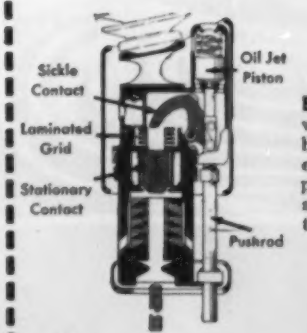
Interrupting Action with *Turbo Jet* Device



Breaker Opening (low current): As sickle and bayonet contacts open, springs in oil jet piston assembly drive piston down and force jet of oil through upper laminated grid and across arc path to quench arc. Current flow is broken.



Breaker Opening (high current): As contacts open, gas forms at sickle and in arcing pressure chamber above bayonet. Oil and gas swirling through laminated grids break up arc path — prevent reestablishment of arc after current zero. Piston accelerates scavenging of arc path.

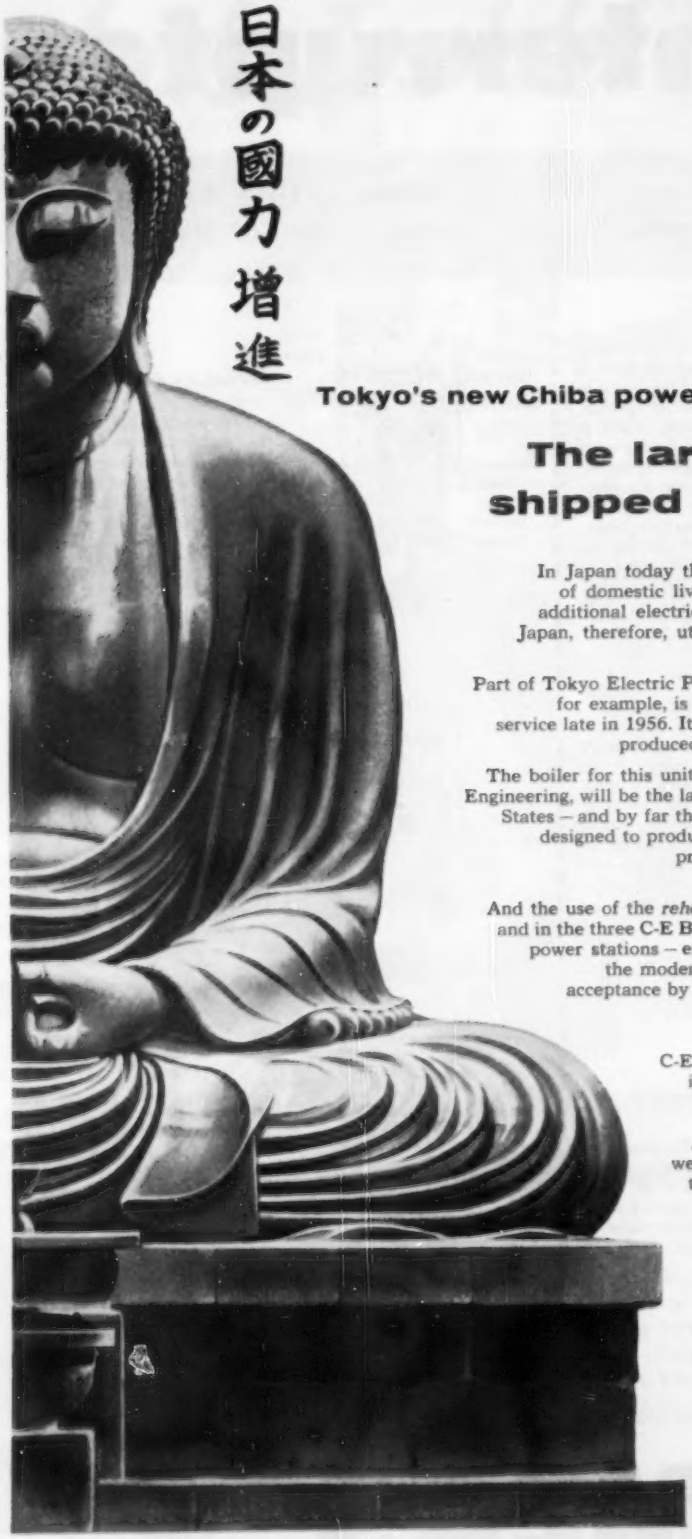


Breaker Open: Complete withdrawal of sickle and bayonet from throat permits escape of remaining high pressure gas. *Turbo Jet* pressure chamber refills with oil through refill holes in hood.

Turbo Jet is an Allis-Chalmers trademark.

CHALMERS

A-4660



日本の國力増進

Tokyo's new Chiba power plant to be served by

The largest boiler ever shipped from the U. S. A.

In Japan today there's growth – of industry, of agriculture, of domestic living standards. It's a growth that requires additional electrical power in huge quantities. Throughout Japan, therefore, utility companies are expanding generating facilities at an unprecedented rate.

Part of Tokyo Electric Power Company's large expansion program, for example, is the new Chiba Plant, scheduled to go into service late in 1956. Its initial capacity will be 125,000 kilowatts, produced by a single boiler-turbine-generator unit.

The boiler for this unit, being designed and built by Combustion Engineering, will be the largest boiler ever exported from the United States – and by far the largest in the Orient. It is a reheat boiler designed to produce 960,000 pounds of steam per hour, at a pressure of 2080 pounds per square inch and 1000° Fahrenheit, reheated to 1000°.

And the use of the *reheat* design in this important power plant – and in the three C-E Boilers being erected in other large Japanese power stations – exemplifies really progressive thinking. For the modern reheat cycle, which has had tremendous acceptance by power engineers throughout the world, is a leading factor in the production of electric power at lower cost.

C-E Boilers of postwar utility designs are now in service, under construction or on order in most areas of the free world. Thus today in Italy, France, Holland and Spain ... in Australia, Formosa, India and Korea ... as well as in principal countries of Latin America, the C-E trade mark has come to mean what it has long meant in the U.S.A. – highest standards of design and performance.

COMBUSTION ENGINEERING C-E

Combustion Engineering Building
200 Madison Avenue
New York 16, N. Y.

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boiler, fuel burning & related equipment; pulverizers, air separators & flash drying systems; pressure vessels; automatic water heaters; soil pipe

The illustration was drawn from a photograph of the Grand Bronze Buddha of Kamakura, courtesy of Japan Travel Bureau.

AEC Issues Safety Rules . . .

. . . for private atom users; permissible radiation, concentration of radioactive material, and waste disposal are aspects covered

The Atomic Energy Commission recently told private atom users how far they can safely go in putting the new energy to work.

AEC issued a regulation setting forth specifies on permissible radiation dosage, concentrations of radioactive material, and waste disposal. Standards were drawn up by the National Committee on Radiation Protection.

The new standards tell businessmen —or, rather, their technicians—how much radiation they can unleash under all conditions. They tell how to stay within these limits.

Safety is a big problem, now that the government has let the bars down, and it will be a bigger problem as more plants come into operation. When and if private enterprise takes on the job of chemical processing of spent fuel elements from atomic power plants, the problem will be tremendous.

So AEC has moved in with its new limits to guide those who are taking their first crack at splitting the atom. For details of the Agency requirements, write to the chief of AEC's Licensing Division for a copy of "Standards for Protection Against Radiation," or pick it up from the Federal Register. There will be 30 days to submit comments or views.

One of the big problems still left unsolved is the "how" of atomic waste disposal. The new regulation tells how much radiation wastes may contain, and it's specific about certain disposal methods—sea burial, for instance, must be accomplished in at least 1,000 fathoms of water, and wastes must be packaged so they won't ever float to the surface. But it does not recommend one disposal method over another; this, the licensee must find out for himself. Specifications are set forth covering ground burial, sewage dumping, chemical dilution, as well as sea disposal.

The regulation also covers radiation monitoring, posting of danger areas, filtration, medical research, and reporting.

Ike Rescinds Nomination Of Whitfield for AEC Post

President Eisenhower last week withdrew Allen Whitfield's nomination for a full term on the Atomic Energy Commission. In complying with Whitfield's request for withdrawal, the President praised the Iowa attorney's "respect for ethics."

Whitfield, facing a hostile Congressional committee probe, telegraphed the President that he would rather withdraw than be forced to answer questions which "would involve a breach of legal ethics . . . incompatible with the proper relationship between clients and counsel." He said his appointment also would involve AEC in a "political controversy."

Whitfield's nomination marked the first time a President has chosen an active political partisan for an AEC post. Eisenhower named him on March 16 to fill the unexpired term of Joseph Campbell, who succeeded to the job of Comptroller General. Then, on April 1, the President put Whitfield's name up for a full five-year term. Neither was acted on by the Senate.

THE INVENTIVENESS OF MAN SHALL BE
TO FIND THE WAY BY WHICH
CONSECRATED TO HIS LIFE"
ATOMS FOR PEACE
3¢ UNITED STATES POSTAGE 3¢

Atomic Postage

The postage stamp design (above), commemorating President Eisenhower's "atoms for peace" plan, was selected by the Post Office Department from 43 suggestions submitted by the Atomic Energy Commission, the State Department, and the U.S. Information Agency. The new three-cent stamp will go on sale in Washington, D. C., July 28.

The words ". . . To find the way by which the . . . inventiveness of man shall . . . be . . . consecrated to his life" were spoken by President Eisenhower before the United Nations General Assembly on Dec. 8, 1953. This inaugurated his "atoms for peace" program and resulted in plans for the United Nations atom conference.

GAW Demands . . .

. . . will hit the electrical manufacturing industry this week when GE's negotiations begin

Guaranteed annual wage demands will hit the electrical manufacturing industry this week when the International Union of Electrical Workers, C.I.O., opens negotiations in New York City for a new contract with General Electric Co.

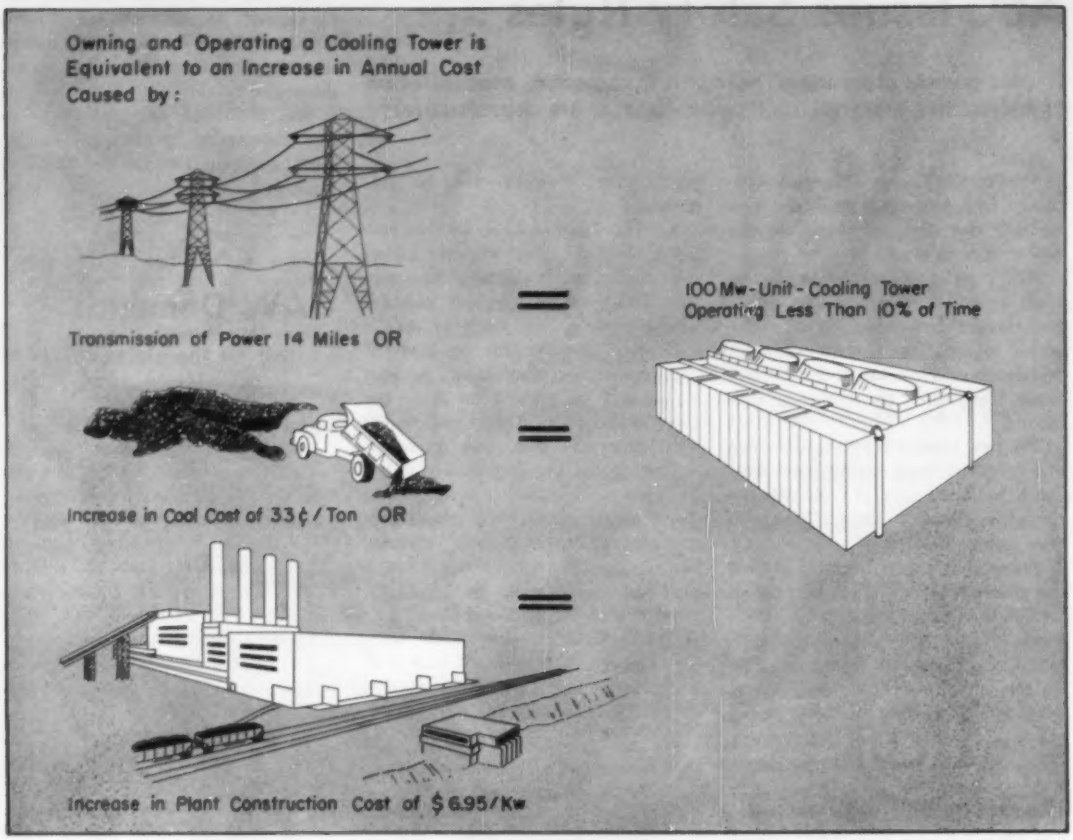
Union Leader James B. Carey has placed guarantees for unemployment compensation high on the list of bargaining points, although the union was stopped short last year in its appeal for a 5%-of-payroll fund to supplement state unemployment insurance benefits for jobless workers.

This year Carey feels that his union demands will have a better chance of acceptance. Recently the union won supplementary unemployment payments for 35,000 workers in General Motors Corp's Electrical Division. And Henry Ford 2nd, who has accepted wage guarantees as president of the Ford Motor Co, joined GE's board of directors last month.

GE executives, however, in unofficial statements since the Ford and GM contracts were negotiated, have declared that they will take a firm stand against any form of the guaranteed annual wage. The company's experience with similar plans in the 1930's, they point out, proved that wage guarantees are impractical in industries dependent on consumer demand.

The union apparently plans to make its stand just as strong. A strike has been set if agreement is not reached by September 15. Other demands include a full union shop, a "substantial" wage increase, and improved fringe benefits.

The IUEW, led by Carey, represents about 100,000 GE workers.


Owning and Operating a Cooling Tower is Equivalent to an Increase in Annual Cost Caused by:
Transmission of Power 14 Miles OR
Increase in Coal Cost of 33¢/Ton OR
Increase in Plant Construction Cost of $6.95/Kw
=
=
=
100 Mw-Unit-Cooling Tower Operating Less Than 10% of Time

Because They Allow Plant Sites Remote From Rivers . . .

Cooling Towers Gain Acceptance*

Their cost compares favorably with added transmission, coal, and construction costs necessary for plants on river sites but distant from load

R. W. GAUSMANN, Power Production Engineer
Indianapolis Power & Light Co Indianapolis, Ind.

Cooling towers are playing an increasingly important part in the selection of steam power plant sites. No longer is it necessary to scour the countryside looking for sizable rivers when planning for a capacity addition. Low-cost, economical steam plants may be built in areas devoid of large rivers by the judicious use of cooling towers and other means of supplementing condensing water.

Based on experience and conditions in Indianapolis the Indianapolis Power & Light Co has concluded that:

1. Annual cost of owning and operating a cooling tower is equivalent to an increase in annual cost caused by any of the following variables:

a. Increasing transmission line length of 14 miles.

b. Increasing coal cost of 33¢ per ton.

c. Increasing plant cost of $6.95 per kw.

2. In modern units, annual cooling tower costs may amount to less than 3% of the total generation costs for the unit.

3. Deep wells, to the extent available, afford an inexpensive source of condensing water.

4. Evaporative cooling from the plant forebay may serve as a second limited source of inexpensive condensing water.

5. Spray ponds, except for very favorable local conditions, cannot compete with cooling towers.

6. Where there is some natural river flow available at a site, an open cooling tower system will be preferable to a closed cooling tower system.

7. Distance between plants on the same river need not exceed 10 to 15 river miles.

Drawing upon the experience of the Indianapolis P&L Co in selecting locations for new capacity additions the following should be considered:

1. Annual costs of cooling towers as compared with other

*Presented before the 17th annual meeting of the American Power Conference, sponsored by the Illinois Institute of Technology, March 30, 31, and April 1, 1955.

variables affecting selection of a plant site.
2. Other methods of supplementing river flow.
3. Open vs closed cooling tower systems.
4. Optimum spacing of plants on a river.

Trend Toward Cooling Towers . . . Many systems are finding that low-cost power may be produced today by installing new capacity near load centers even though circulating water resources are limited at such sites. Developments favoring additions to plant capacity in such locations are:
1. Right-of-way for transmission lines into urban areas is difficult to obtain.
2. Modern units need less condensing water per kw than older, less efficient units. Present preferred standard reheat units operating at 1,450 psi and 1,000F require only 60% of the condensing water per kw output required by the 400 psi 700F units of 25 years ago, and they require only 80% of condensing water required by 850 psi 900F units. Supercritical pressure, double reheat units now under development will use even less water.
3. The general trend toward 3,600 rpm for single-shaft units reduces the savings to be gained by high vacuum. Due to the higher leaving losses of these high-speed machines, less effective use can be made of cold condensing water.
4. Experience has demonstrated that large plants can place dependence on modern type cooling towers as their sole source of condensing water.

Cooling Tower Costs . . . The annual cost of owning and operating a cooling tower, as calculated for economic comparisons between plant sites, should take into consideration:
1. Annual investment costs. These include all annual charges which will vary with the amount of the investment cost. In the accompanying table, these annual costs amount to 14.3% of the installed cost.
2. Auxiliary power charge. This includes a fuel charge for the kilowatt-hours used in the tower as well as a capacity charge based upon the reduction in plant capability due to power used in the tower.
3. Vacuum penalty which includes a fuel charge and a capacity charge for any difference in condensing water temperature between plant sites being studied.
4. Direct operation and maintenance costs. These include increases in labor and in maintenance supplies caused by the cooling tower installation.

The accompanying table shows the annual costs for a cooling tower scheduled to be installed by the summer of 1957 in one of the Indianapolis P&L plants to serve a new 100-Mw unit during periods of low-river flow. It is expected that the tower will be in operation less than 10% of the time and hence low construction costs will be a prime objective in its design.

The investment cost, in this instance, represents the major portion of total annual costs. Auxiliary power costs and vacuum penalty costs are low since the tower will be operated only during low water periods. Our experience indicates that the estimated cost of $9,600 per year for maintenance may be high. Annual cooling tower costs are estimated to be only 2¾% of the total annual costs for owning and operating the 100 Mw unit.

If a proposed unit is moved away from a load center in search of a site where a cooling tower is not necessary, some changes may be expected in electrical transmission, coal freight, and construction costs. Construction costs will include items such as cost of land, range between flood and minimum water levels, foundation problems, and length of railroad spur required.

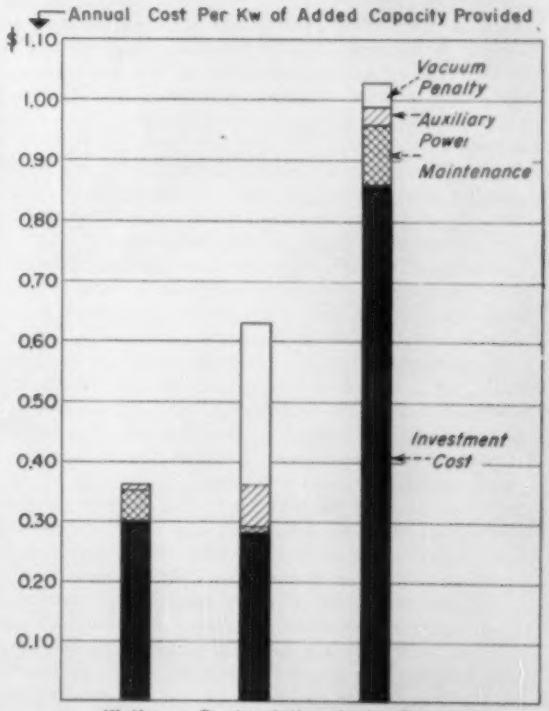
Annual Cooling Tower Cost

(100-Mw Unit - With tower operating less than 10% of time)

	Annual Cost
Investment Cost	**$82,300**
Auxiliary Power—coal charge	**1,500**
—capacity charge	**1,700**
Vacuum Penalty—coal charge	**2,100**
—capacity charge	**2,200**
Maintenance Costs	**9,600**
	$99,400

Other Methods . . . Other means of supplementing river flow will at times produce lower annual costs than cooling towers. Such methods are generally limited in capacity and are unique to a given plant site. Indianapolis P&L has successfully used the following methods:
1. Deep wells.
2. Spray ponds.
3. Evaporative surface cooling.

Deep wells normally may be developed at a plant site where there is a relatively porous strata of gravel adjacent to the river. Such gravel deposits will be recharged each



COMPARATIVE COSTS favor deep wells and recirculation. However, additional capacity from these sources is limited

Cooling Towers Show Favorable Costs

(*Continued from previous page*)

spring and will permit withdrawal of cool water during the dry seasons. Indianapolis P&L has a total capacity in deep wells of 33,000 gpm of 56F water. Because of its low temperature, this well water is equivalent to nearly 100,000 gpm of river water. Deep wells have an advantage over other means for supplementing river flow in that the well water flow benefits all plants downstream from the plant at which wells are located.

Spray ponds, in general, have been found to be unattractive economically compared to cooling towers. In one plant, however, a low-cost spray installation was made where a railroad trestle crossed the river near the intake.

Some evaporative cooling normally may be obtained at any plant site by recirculating a portion of the condensing water discharge back to the intake forebay. At one plant, a longer recirculation path was provided by placing the diversion dam about one-half mile downstream from the plant. The discharge canal was lengthened so that the condensing water normally discharges below the dam, but in times of low water, a portion of the water automatically recirculates to the plant intake.

In this plant the natural minimum river flow of 75,000 gpm increases in temperature as it passes through the plant and is responsible for carrying 40% of the exhaust heat downstream from the plant. The 15,000-gpm well water flow, due to its low temperature of 56F, is responsible for carrying away 19% of the exhaust heat in spite of the rather small flow. Evaporative cooling from large recirculation flow removes an additional 15% of the exhaust heat. A new cooling tower at this plant will be sized to remove the remaining 26% of the exhaust heat.

Minimum natural river flow at the plant is only adequate for serving 145 Mw of capacity. The various methods for supplementing this flow have permitted plant capacity to be increased to 364 Mw.

Annual costs for the various methods used in supplementing river flow at this plant accompany this article. These annual costs are expressed as "per kw of added capacity provided" to permit direct comparison of costs.

The chart indicates that deep wells provide the most economical means of supplementing river flow. As in most instances, however, only a limited amount of well water may be made available to this plant.

In providing a longer recirculation path, the discharge canal had to be extended to a diversion dam constructed about one-half mile downstream. A railroad underpass for the canal nearly tripled the cost and explains the rather large investment cost charged against the project. Auxiliary power requirements also are rather high because of the head loss through the underpass. The vacuum penalty chargeable against recirculation is large as surface cooling from a forebay cannot be expected to reduce recirculated water temperature as effectively as a cooling tower.

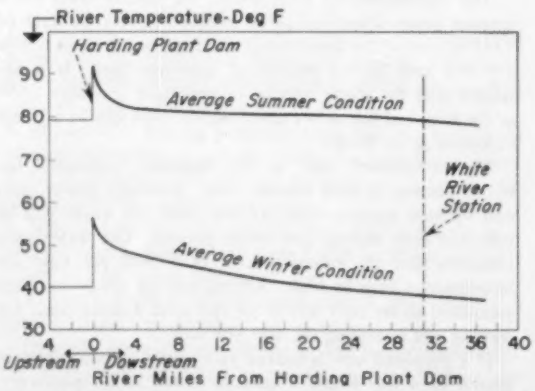
The investment cost for the cooling tower is comparatively high in spite of efforts to reduce it. The tower will use a simple discharge canal instead of a discharge piping system. Outdoor-type deep-well pumps will supply the tower. Maintenance cost for the cooling tower is somewhat higher than for the wells but only a minor portion of the total cooling tower cost. As an open system is planned, auxiliary power and vacuum penalty costs are rather small.

Open vs Closed Towers . . . Cooling towers may be installed in an open or a closed system. In an open system, river water is the normal source of condensing water. At low river flow, some condensing water discharged from the plant is pumped through the tower into the intake forebay.

In a closed system, condensing water for one or more units in a plant is isolated from any other source of condensing water and all water is passed through the tower for cooling. A supply of water, usually chemically treated, is necessary to provide make-up water in a closed system to replace losses due to evaporation, spray losses, and blowdown. For a plant with no sizable source of condensing water, closed system cooling towers are the only choice.

At Indianapolis P&L plants, closed system cooling towers have been investigated due to the highly polluted river water available during low-water conditions. The open system has been chosen because the cleaner condensers and cooling towers obtainable with the closed system appear to be more than offset by the following arguments against a closed system:

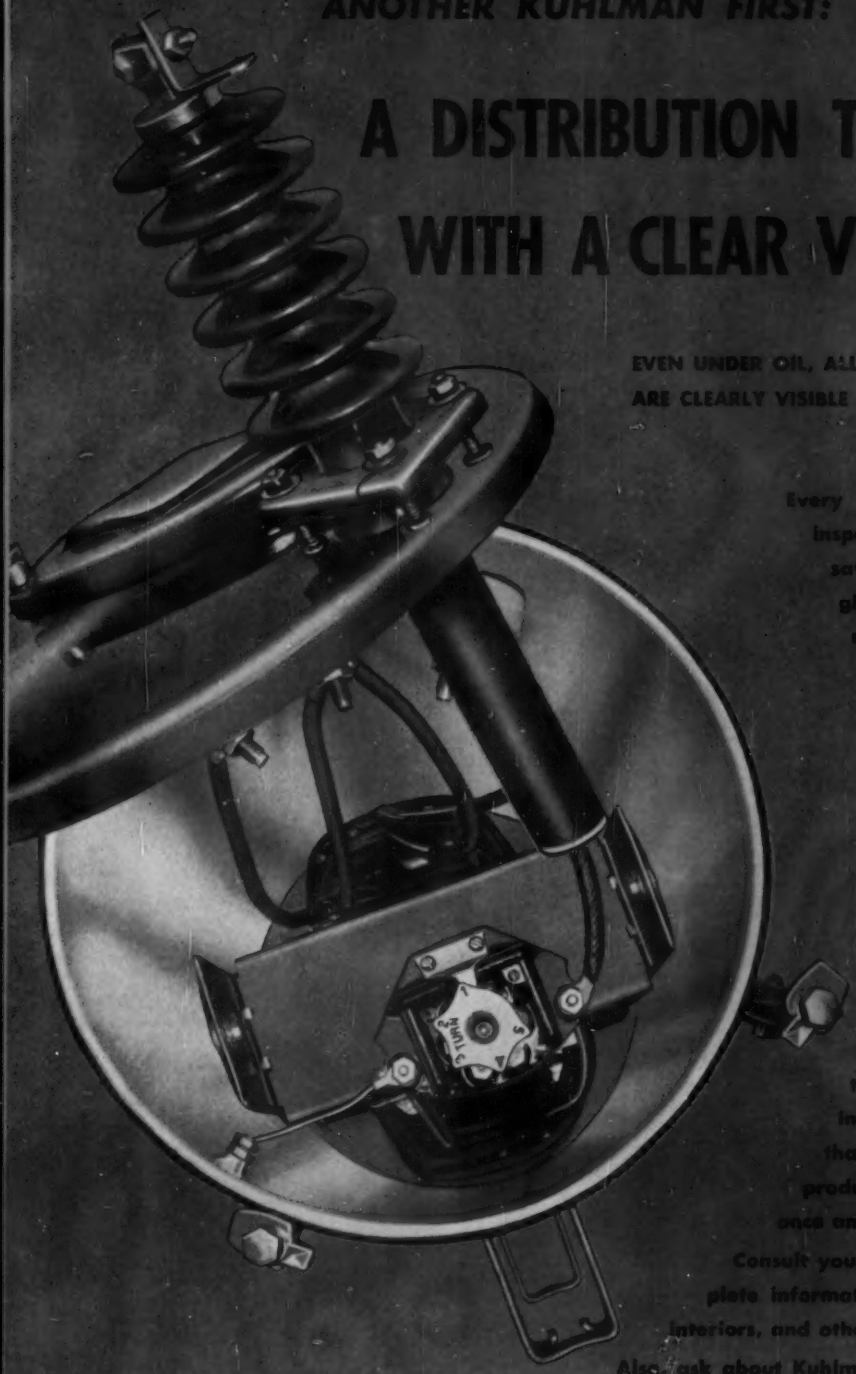
1. A closed tower system is expensive due to the cost of water treating equipment and added piping required. Under normal conditions these costs offset the added investment required with an open system for a river intake and circulating water pumps.
2. A closed system results in lower plant reliability as the operation of the unit depends upon cooling tower operation throughout the year. This may be offset by arrangements to transfer to open system operation when necessary, but the cost of such arrangement is high.
3. An open system avoids cooling tower operation during winter when fogging and icing are prevalent.
4. Maintenance costs, auxiliary power use, and vacuum penalty should be decreased with an open system due to the reduced hours of tower operation.
5. Tests at one plant have shown that cooling towers and condensers can be operated successfully, even though the condensing water is grossly contaminated with partially treated sewage, provided sufficient intermittent chlorination capacity is available.



DISTANCES between plants on the same river can be reduced by using cooling towers to supplement cooling by river

ANOTHER KUHLMAN FIRST:

A DISTRIBUTION TRANSFORMER WITH A CLEAR VIEW INTERIOR



EVEN UNDER OIL, ALL TRANSFORMER COMPONENTS ARE CLEARLY VISIBLE FOR INSPECTION.

Every utility man knows that periodic inspection of distribution transformers saves on maintenance costs. Kuhlman's gleaming white interior tank walls make the inspection job easier. All connections, operating parts, and the bottom of the tank are clearly visible. The condition of the oil, vitally important to long transformer life, can easily be observed to insure top transformer performance.

Yes, Kuhlman white tank wall interiors invite your inspection. You can see for yourself the sturdy, compact construction and skillful workmanship of Kuhlman distribution transformers. Inspection after inspection will offer positive proof that Kuhlman transformers are quality products built for trouble-free performance and easy maintenance.

Consult your Kuhlman representative for complete information on Kuhlman's new clear view interiors, and other exclusive features.

Also, ask about Kuhlman's porcelain enameled finish for corrosive atmospheric conditions.

KUHLMAN

KUHLMAN ELECTRIC COMPANY, BAY CITY, MICHIGAN • CRYSTAL SPRINGS, MISSISSIPPI • SALINAS, CALIFORNIA

NETWORK
TRANSFORMERS
for easy maintenance, great reliability

NEW WING RADIATORS

make G-E network transformers easy to clean and paint . . . and give extra reliability

The new "wing" radiators make it easy for you to clean and paint G-E network transformers because you have extra room to reach tubes and tank. The new radiators, featuring box-brace headers, increase reliability because they reduce the possibility of leaks and give added structural strength.

EASY TO CLEAN AND REPAINT

You can easily clean the tubes by pushing a long-handled brush between the banks of radiator tubes, either from the top or from the ends of the transformer. Periodic cleaning is the best defense against corrosive accumulations of water, sewage, dirt, and chemicals (such as salt used for snow removal).

It's also easy to repaint transformers with the new wing radiators either by the flow method or by brushing—just use a long-handled nozzle or brush in the same way you use the cleaning brush.

INCREASED RELIABILITY

By using headers to carry the circulating oil or Pyranol* from the tubes into the tank, the number of entrances to the tank is greatly reduced. On the new 500-kva network transformer, for example, there are only 16 entrances into the tank instead of 56 on the previous design. This greatly reduces the chance for leaks.

SIMPLIFIED MAINTENANCE

The tank cover and switch are welded to the tank, thereby eliminating large gasketed areas and further reducing the possibility of leaks.

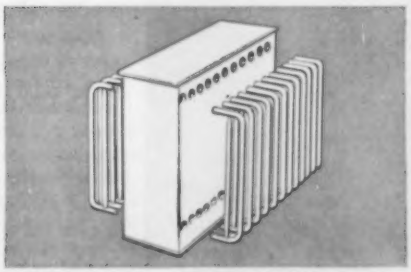
The new wing design also reduces the chance for corrosion to start. Radiating surfaces are vertical, not horizontal, and corrosive elements—water, sewage, etc.—do not readily collect on the radiators.

Maintenance is simplified in other ways. You can remove bushings, for example, from the outside of the tank. There are no large gaskets to replace. Accessories are located on the high-voltage end of the transformer where you can reach them easily. It's a simple matter to inspect the network protector because it slides out on rails.

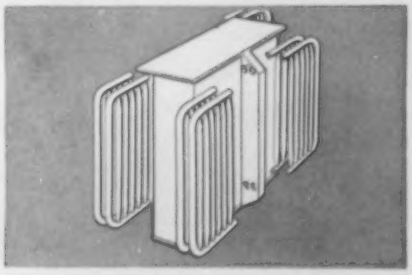
HELP FOR YOU

For help in solving your network problems and for complete information on the advantages of G-E network transformers with wing radiators, see your local G-E sales representative. General Electric Company, Schenectady 5, New York. 4154

*Reg. Trade-mark of General Electric Co.



CONVENTIONAL-DESIGN RADIATORS have many tank entrances (blue circles). Horizontal surfaces collect dirt—maintenance is difficult.



NEW "WING" RADIATOR with box-brace headers has few entrances into tank and gives great structural strength, and is easy to clean.

Progress Is Our Most Important Product

GENERAL ELECTRIC

U. S., Britain, Canada Compare Notes on Atom

Nuclear power occupied the spotlight at Canadian Electrical Association's 65th annual convention held recently in Vancouver, British Columbia, where atomic energy experts from Britain, the United States, and Canada compared notes on reactor development.

W. Kenneth Davis, director of Division of Reactor Development, U. S. Atomic Energy Commission, pointed out that the high cost of fissionable material presented one of the most difficult problems in development of commercial nuclear power.

"A truly economic nuclear power industry must be based on re-use of by-product fissionable material as reactor fuel rather than for weapons' purposes," Davis said. The U. S. is aiming for a 'power-only' reactor rather than a 'dual-purpose' reactor, he added, and "it has been made clear that fuel grade prices for fissionable materials were the most that could be expected over any extended period of time."

He cited technical and economic arguments against the "dual-purpose" approach, including the contention that adding electric power producing facilities to a production reactor to make it a dual-purpose one may actually increase the cost of the plutonium made.

Development of nuclear power reactors, the AEC official declared, depends on assistance from the AEC or from industry, and "our objective is to be sure that such assistance does not interfere with traditional cost incentives of private industry or with the incentive to achieve the best possible 'power-only' reactors as soon as possible."

If nuclear power can be produced in Britain for less than 7 mills it will be considered economic, according to J. A. Jukes, economic adviser to Britain's Atomic Energy Authority. That's the present cost of generating electricity in the United Kingdom from new base-load coal-fired power stations. (These costs, he explained, are based on British interest rates and costs for capital equipment.)

Jukes forecast that by 1965 Britain will have nuclear power stations that can compete with conventional power stations, and by the 1970's the nation will cease building coal- or oil-fired stations and will concentrate on nuclear power.

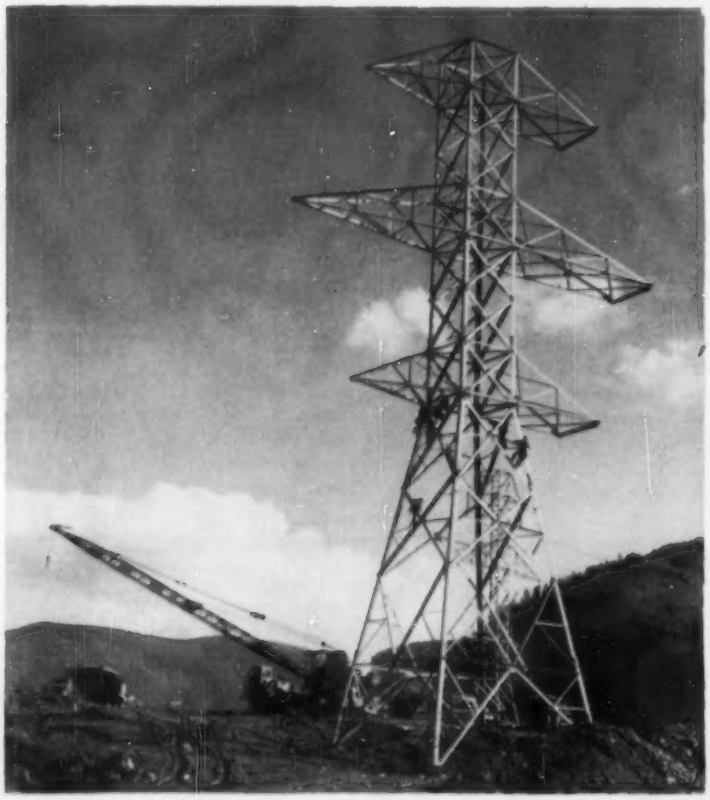
Britain's provisional program calls for expenditure of $800 million on 12 nuclear stations during the next 10 years, he added.

Points from Canada's Chalk River

Jukes said the operating life of the equipment has been estimated conservatively at 15 years, with an 80% load factor. Discussing operating costs, he said experience at Chalk River demonstrated that it is possible to obtain over 3,000 Mw days (70 million kwhr) from a ton of fuel, or the equivalent of the heat from 10,000 tons of coal.

Experience gained with NPD—Canada's first nuclear power reactor—was recounted by John S. Foster, member of the Nuclear Power Group, Atomic Energy of Canada, Ltd., at Chalk River. This group developed a design for a 20 Mw reactor that employs natural uranium fuel in form of metal rods immersed in the pool of a heavy-water moderator. Estimated cost is $10- to 12-million, of which about $8 million is for reactor plant and $2 million is for conventional plant.

One purpose of the plant, Foster said, is to provide a basis for estimating the economics of future full-scale nuclear power produced by "power-only" reactor plants.



BPA's 345-kv Line Nears Completion

The Bonneville Power Administration's 345-kv transmission line from Chief Joseph Dam to Snohomish, Washington, has been scheduled for completion sometime in August. Shown above is one of the line's 660 towers which will carry power 132 mi across the Cascade Mountains. Some of the towers, fabricated by Pacific Coast Bethlehem Steel Corp in its Seattle and San Francisco shops, are 115 ft high.

There's always a CHANCE for a better connection

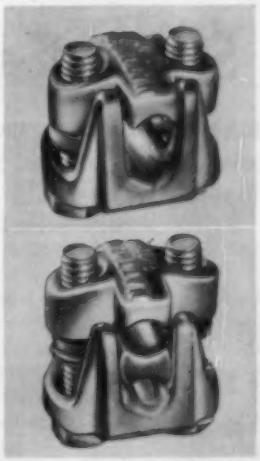
When you're looking for a good connection — don't overlook CHANCE. Because — whatever type connector you want, chances are Chance has it. Everything from parallel groove clamps to solderless terminal lugs. The Chance line represents a wide variety of connectors — all available from a single source — your Chance Distributor.

Uni-clamps go on fast— clamp tight—cost less than split-bolts of the same size

A "one-piece" clamp for conductors 1/0 through 1000 MCM. Uni-clamps are easily installed without taking them apart . . . offer a wide contact area plus extra strength for permanently tight contact. Smooth-rounded castings can be readily covered with protective tape. Available for copper, aluminum, or bi-metal connections.

z.l.n. 100 Electrical contact sealing paste

Protects any bi-metal combination against corrosion and improves conductivity. Waterproof, stays plastic. Works in all temperatures. Non-toxic. Non-inflammable.



Parallel Groove Clamps*

Heavy-duty Parallel Groove Clamps

Uni-Clamps

Split-bolts

Multi-taps

Service entrance connectors

Transformer terminals

*Chance Parallel Groove clamps are made in two types: Type "AA" for aluminum to aluminum connections; Type "AGP", fortified cadmium coated, for all conductor combinations. AGP clamps don't require an insert . . . can't be put on wrong. Either side will take copper or aluminum.

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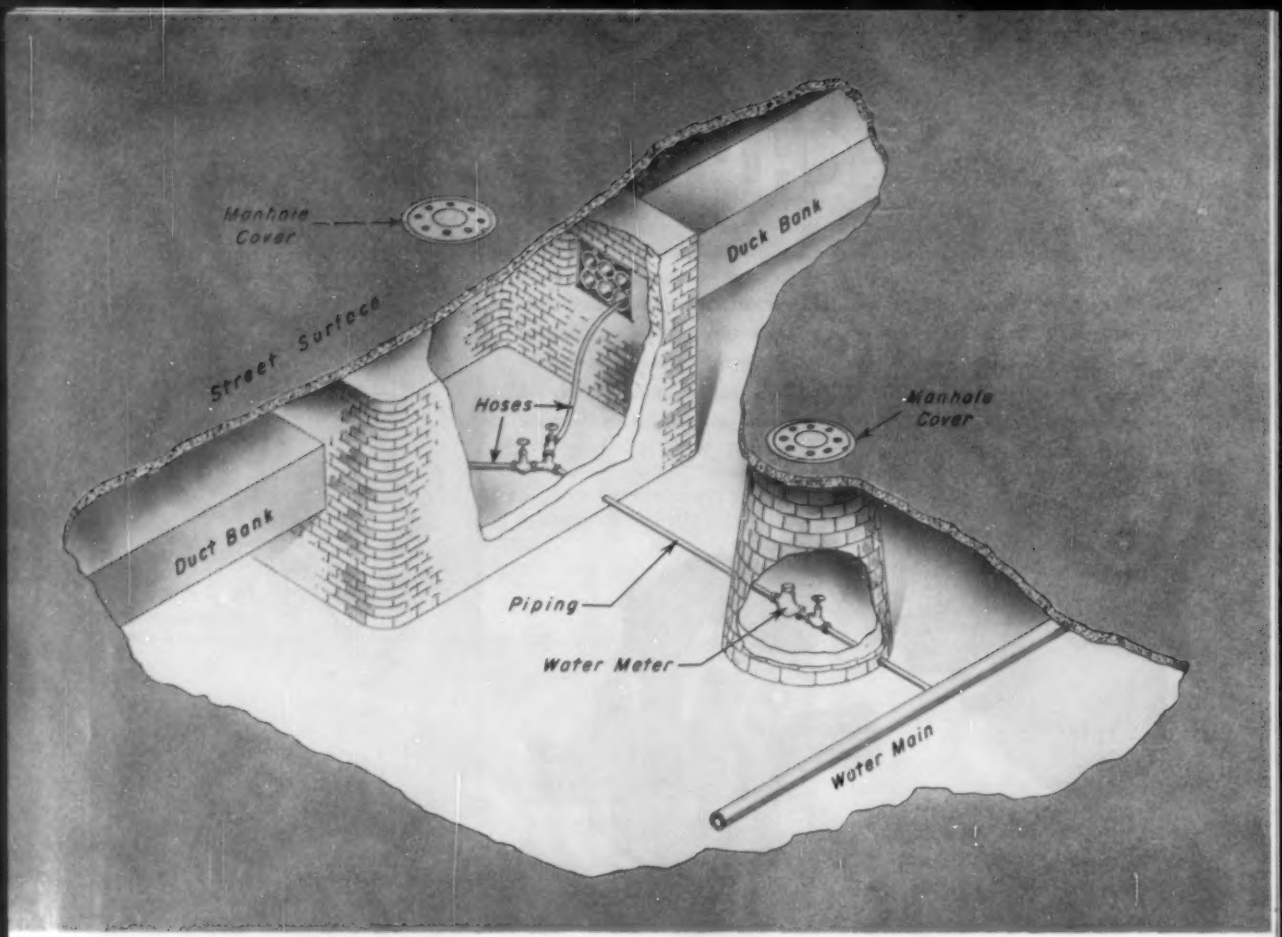


WATER WAS PIPED FROM THE CITY MAIN THROUGH A METER PIT TO TWO HOSES IN THE UTILITY MANHOLE

DISTRIBUTION—Operation

Water Cooling Stops Cable Failures

United Illuminating Co saturates the earth around conduit banks with water to increase the heat dissipating ability of the earth, which has dried out

FLOYD W. BUCK, Superintendent of Engineering, United Illuminating Co, New Haven, Conn.

A water cooling system has been installed by United Illuminating Co to saturate the ground around underground cable ducts for increasing the heat dissipating ability of the earth. Use of the system for over 20 months has eliminated 15-kv cable failures caused by overheating.

The system consists of a hose that discharges city water at the high point in an empty duct. The water runs down the duct toward manholes at either end and soaks through the ducts, dampening the dried out soil. Duct temperatures have been thus reduced more than 17C.

Overheating Causes Failures . . . Installation of the cooling system stems from a number of 3-phase localized failures in 250-MCM, varnished cambric insulated cables having lead sheaths. Three failures occurred at almost the same spot in a street conduit bank. One cable rated at 200 amp failed at 135 amp. These failures lead to the belief that some factor external to the cable was the cause.

Several weeks of unusually warm, clear weather preceded the breakdowns. And the company found that the cable and conduit-bank temperatures had exceeded 50C. As temperature goes up, the dielectric loss of varnished cambric also rises. This further increases the temperature, and continuation of the cycle causes "runaway."

Therefore, the company concluded that the cables failed because of high temperature alone.

Ground Too Dry . . . An investigation was started to determine why the conduit bank was so hot in view of the reasonable loads on the feeders. The soil, a fairly good grade of gravel, was found to be warm and completely dry around the lower half of the duct bank for a distance of over 1 ft away. Because dry gravel is an excellent heat

insulator, the ability of the earth to dissipate heat from the cables was very seriously reduced.

The conduit is under a paved street. Because the street is essentially waterproof, there is no way for ground water to be replaced. Ground-water level in the New Haven area has been dropping, as it has in many parts of the country. The logical solution was to restore the earth moisture artificially.

To locate the overheated ducts a thermocouple was inserted at least 15 ft into an empty duct in a bank. This gave a fair indication whether cooling was necessary. Where duct temperature showed a tendency to climb, a maximum-reading thermometer was inserted about 5 ft into the duct.

How to Cool With Water . . . City water replaced ground moisture. This was done by piping from the water mains through a street meter pit, built separate for the conduit system, to the company's manhole. Here the service was valved in each direction and then connected to garden hose, which would withstand the 85-psi water pressure.

So that water would be discharged at the high point of a ductline, standard ½-in. pipe fittings and two couplings were attached to the proper lengths of hose. The couplings were drilled with enough 1/16-in. holes to enable the desired amount of water to be released into the somewhat porous duct system, consisting of 18-in. lengths of vitreous clay with butt joints and encased in 2-in. of porous concrete.

Considerable time was required to determine the correct number of holes in the couplings. A larger quantity of water had to be discharged into the duct initially to saturate the bank than could pass through the conduit wall and into the ground. When the bank was saturated and water came out at each end of the ducts, the holes in the couplings were reduced so that a slight trickle remained at the face of each manhole.

The operating department insisted that the hose be inserted in the bottom tier of ducts or in an empty duct, so that water could not drip onto cables under the hose. This was practicable in all but one span, and in over 20 months no failures have occurred. Before the cooling system was installed temperatures of many ducts were above 50C and as high as 57C. In 1954 all conduits were maintained under 40C, the maximum limit set by the company.

Duct Temperatures Before and After Repairing Hose Split

	Before	After 1 Week
1st Manhole West of Split	27C	32C
2nd " " " "	34C	34C
3rd " " " "	38C	35C
4th " " " "	45C	37C

Experience shows that water can be delivered no farther than 2,000 ft in each direction from a meter pit. Beyond that point there is insufficient pressure.

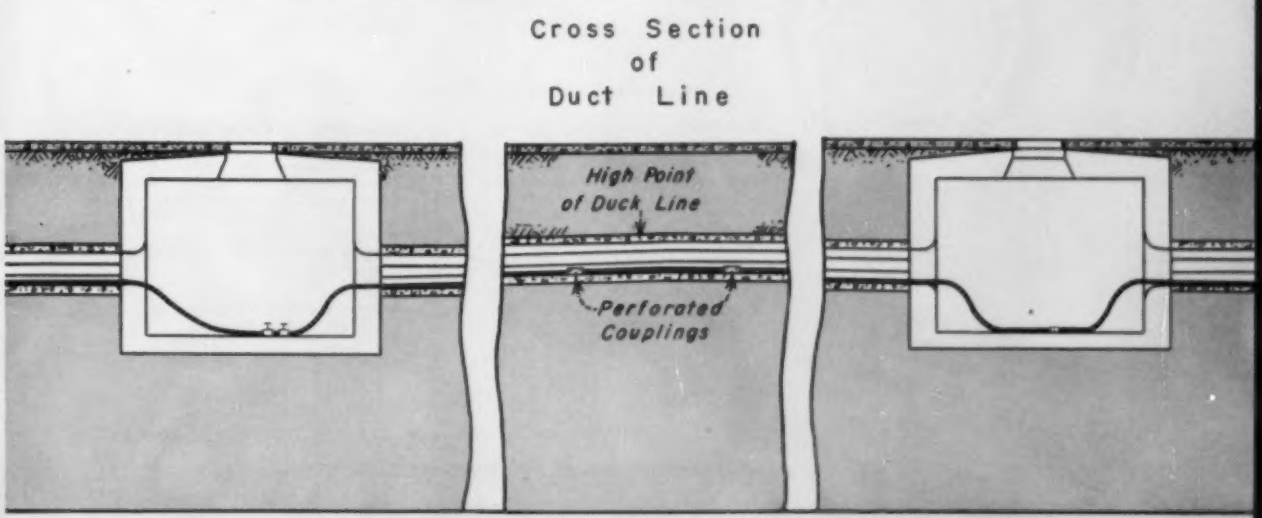
A total of 21,000 ft of hose and eight meter pits adequately protect cables in downtown New Haven. The system is operated from April 1 until the hot weather is definitely over in the fall. Last year it was "turned off" on October 15.

During the "on" period 9.6 million gal of water were delivered, costing $2,500.

Quality of Hose . . . Initially an inadequate quality of hose was purchased resulting in a number of hose failures close to the meter pits. These accidents, however, gave some indication of what can be accomplished by direct cooling with cool water.

The accompanying table shows the duct temperatures at different manholes before and after repairing a hose split discovered soon after the system was put in operation.

The 27C temperature resulted from a small flood near the split, while other points of the duct warmed up because of the inadequate supply of water.



GARDEN HOSE CARRIES WATER TO THE HIGH POINT OF THE DUCTLINE AND TO ADJOINING DUCTLINES

No loose connections . . . greater safety for linemen with the *NEW* LOCKED LOW VOLTAGE BUSHING . . .

on Wagner Form W Distribution Transformers

Here's just one of the many important extra features that you get when you buy Wagner Pole Type Distribution Transformers. Wagner's *new* locked low voltage bushing on Form W Transformers is key-locked to prevent rotation. A projecting key in the tank opening fits in a groove on the porcelain. The terminal is locked to the porcelain in a similar manner so it is impossible for the bushing assembly to slip or turn when the terminal is being tightened or loosened.

This means . . .

1. No loose connections on the inner end of the terminal studs because it is impossible for these studs to turn when the terminals are being tightened.
2. Greater safety for the lineman when connections are being made to the terminal.

Wagner Form W Transformers have these ADDITIONAL FEATURES . . .

SHUR-SEAL COVER — INHIBITED OIL

Form W Transformers come with the Wagner Shur-Seal Cover and are filled with an *inhibited oil*. The Shur-Seal Cover makes a *positive* seal which prevents oil contamination caused by "breathing" of atmospheric moisture and dust particles. The inhibited oil reduces oxidation to a minimum and retards the formation of acids and sludge which cause rapid transformer deterioration. Together, these features add years to the life of Wagner Form W Transformers.

NOW SHIPPED TO YOU IN DRUMS

Wagner Form W Distribution Transformers from 3 to 10 kva are now packed in sturdy fiber drums for ease of shipping, handling and storage. Each drum is sealed so that when it is opened, the transformer is as clean and free of harmful foreign particles and grease as the day it left the Wagner plant.

Write for your copy of Bulletin TU-180. It gives complete information on Wagner Distribution Transformers.

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6456 PLYMOUTH AVE., ST. LOUIS 14, MO., U.S.A.

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

ELECTRIC MOTORS
TRANSFORMERS
INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

YES-7

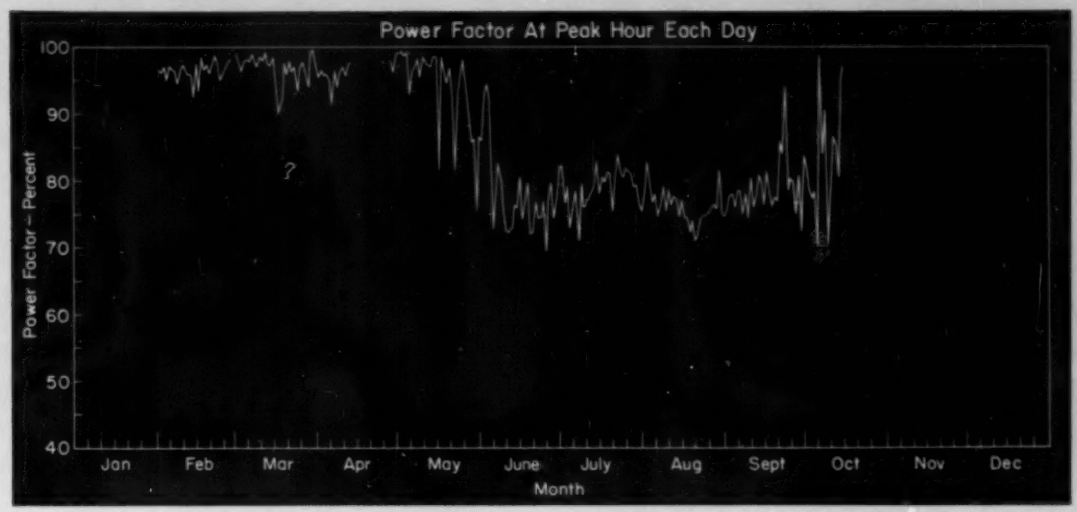


FIG 1—POWER FACTOR ON SECONDARIES DROPPING AS LOAD ROSE PROMPTED REVISION OF TRANSFORMER LOAD CHECK

Peak Months Fix Transformer Load

Power factor drop prompts Oklahoma G&E to base statistical transformer load check on summer kwhr use data, new method reflects rapid changes

HUGH LAWYER, Engineer,
TOM R. HOKE, Engineer,
Oklahoma Gas & Electric Co
Oklahoma City, Okla.

Last summer's rapid load increases has prompted Oklahoma Gas & Electric Co to revise its technique of determining the loading of transformers supplying residential secondaries so that load increases are reflected more quickly. For several years, the company has determined a transformer's annual peak kva demand from the average kwhr consumption of customers served by it. This statistical analysis method is both accurate and inexpensive.

A recent time check of the method, as applied to 197 transformers, showed that a total of 0.9 man-hours were required per transformer. Of this, 0.65 man-hours per transformer station were used by engineering department personnel in making sketches, checking in the field, and calculating load from the total kwhr figures supplied by the accounting department which, in turn, used 0.25 man-hours per transformer station. The total represented only 0.077 man-hours per customer.

But tests with graphic watt and var demand meters last summer showed that the average secondary power factor during the peak period had declined from 98%, the value formerly used in determining demand, to about 80% during the summer load period. Fig 1 shows typical secondary power factor during peak hour each day.

As the system now experiences peak load during the summer, the company considered it logical to use that summer month's consumption as the basis for the new load check method. As highest temperatures do not occur invariably in the same month, the company decided to use the total consumption for the four-month period, June through September. In this way, a new load added during the period would be reflected immediately in the transformer load determination.

Field Check Made . . . Field data was collected from 73 transformer stations scattered at random over the service territory. These transformers served 1,132 customers. Saturation of room-type air conditioners was 390 units, or 34.5%. Demand kva for each transformer was obtained from maximeter checks for at least one week and average voltage between "on" and "off" readings. Most readings were obtained in July when maximum daily temperatures exceeded 100F for several weeks. These were used as the annual peak transformer demand.

Earlier tests had established the demand multiplier, or diversity factor curve shown as Fig 2. The curve shows the relative diversity for various group sizes and is used to equate test data to a common base group of 75 customers by means of the following formula:

$$\frac{\text{Test kva}}{\text{Avg customers on test transf}} \times \frac{\text{Factor from Fig. 2 for 75 customers}}{\text{Factor from Fig. 2 for No. of customers on test transf}}$$

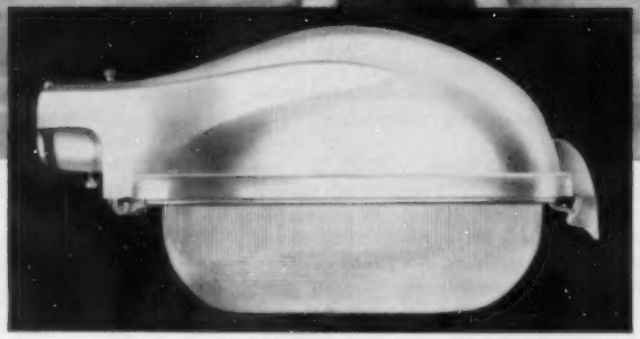
Six-Step Process Developed . . . Adjusted test kva per customer was then plotted against average customer kwhr sales for the four-month period, for each test transformer. The points, plotted in Fig 3, show that a definite relationship between the four-month average usage and maximum transformer demand. The average curve shows this relationship.

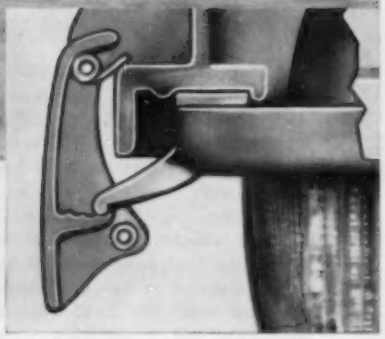
Transformer load may be determined as follows:

1. Determine the total kwhr sales through the transformer for the four summer months from route books.
2. Divide the total sales by average

(*Continued on page* 30)

A typical example of Westinghouse street and tunnel lighting. OV-20's in the foreground, FU-72 luminaires in the tunnel.





Automatic latch (upper right)—As globe closes, latch locks in position. Built-in, double-torsion spring provides driving power for latch. Leaf spring on hinge side provides upward pressure, seating globe tightly against gasket.

Why Seattle specified Westinghouse OV-20 luminaires on their new freeway

Problem: Select a street light that would give Seattle drivers the best possible night visibility on the new Alaskan Freeway and smooth good looks by day. A point-by-point analysis showed Westinghouse OV-20 mercury luminaires to have these qualifications as well as the following superior mechanical construction and maintenance features.

One-piece cast aluminum housing—adds rigidity and weather resistance to the OV-20.

New optical system—New reflector and refractor design improves distribution of light along the street.

Weatherproof seal—between the housing and glassware, holds cleaning to a minimum.

One-hand maintenance—Cleaning, washing and relamping can be done without tools, and without exposing the wiring or damaging the stationary reflector. Open-type latch makes it impossible to drop glassware while cleaning.

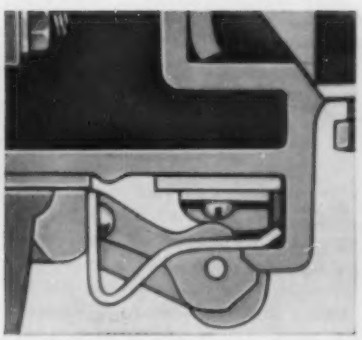
Smooth good looks—Mounted on either concrete or metal poles, the modern unbroken design of Westinghouse mercury luminaires adds a progressive appearance to large communities and small.

And the Westinghouse OV-60, second member of the mercury family, gives wide streets better visibility and greater uniformity of pavement brightness—with all the plus features of the OV-20.

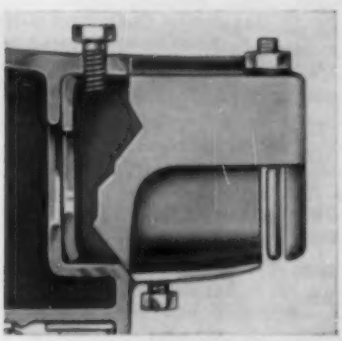
Be sure you specify Westinghouse OV-20 mercury luminaires—the original mercury street light—copied in general appearance but never duplicated in performance. More information? See your nearby Westinghouse representative. J-04379

YOU CAN BE SURE...IF IT'S Westinghouse

Pressure-type terminal makes sure of a tight connection without damaging the conductor. Unnecessary maintenance expense is minimized by this construction.



Open-type hinge speeds cleaning time. To remove glassware, swing back and lift out. This design feature makes maintenance quick and easy.



Bug-proof wiring—Offset pipe stop shoulder, inside slip fitter, prevents entrance of water. Felt gasket on pipe stop eliminates dirt and bugs.

number of customers to find average kwhr sales per customer.

3. Enter curve (Fig 3) with the average kwhr sales and read per customer demand.

4. Read diversity factor corresponding to number of users from Fig 2.

5. Multiply per customer demand by the diversity factor from Fig 2 to obtain corrected diversified demand per customer.

6. Multiply corrected demand per customer by the number of customers.

Steps Reduced . . . This six-step procedure has been simplified by combining several steps and charts into the alignment chart in Fig 4, use of which reduces the procedure to the following:

1. Determine the total kwhr sales through the transformer for the four summer months from route books.

2. Determine the average kwhr sales per customer.

3. From Fig 4 find transformer load on the middle scale by drawing a line from the number of customers to the kwhr consumption per customer.

In practice, a freehand map of the transformer secondary is prepared in the field.

This map shows transformer location, service drops from each pole, and secondary cuts. On each service drop, the corresponding address is shown. For small towns the meter number is shown in lieu of the address.

This sheet is sent to the accounting department where kwhr use for each address is entered, data for each pole being kept on consecutive lines. This sheet is returned to the engineering department where clerical forces determine the loading. For areas requiring attention, essential information for determining pole-by-pole loading, voltage drop, and transformer sizing or relocation, are presented. Additional data columns provide for rechecking without preparation of a new sheet.

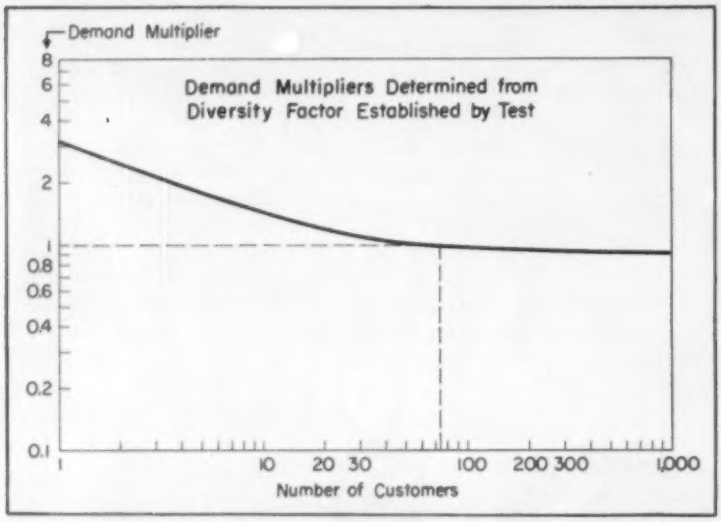


FIG 2—DEMAND MULTIPLIER was determined from diversity factor obtained from field tests. Curve is based on demand multiplier of 1.0 for 75 customers

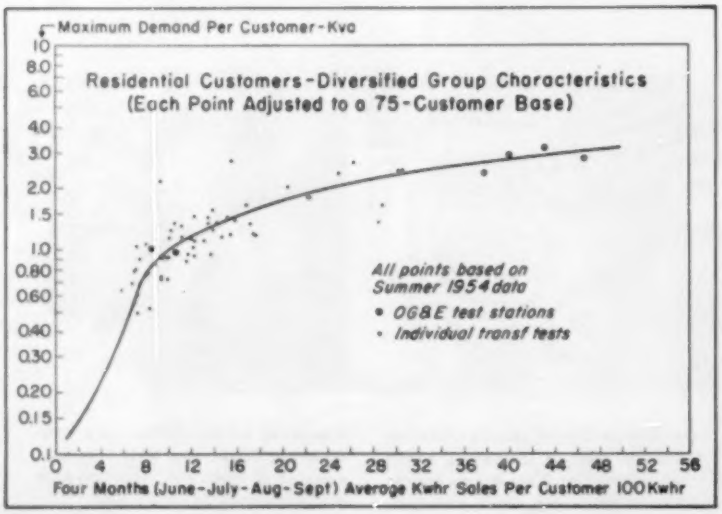


FIG 3—DEMAND PER CUSTOMER, determined from field tests, is plotted against kwhr sales for four months. Points are adjusted to 75-customer groups

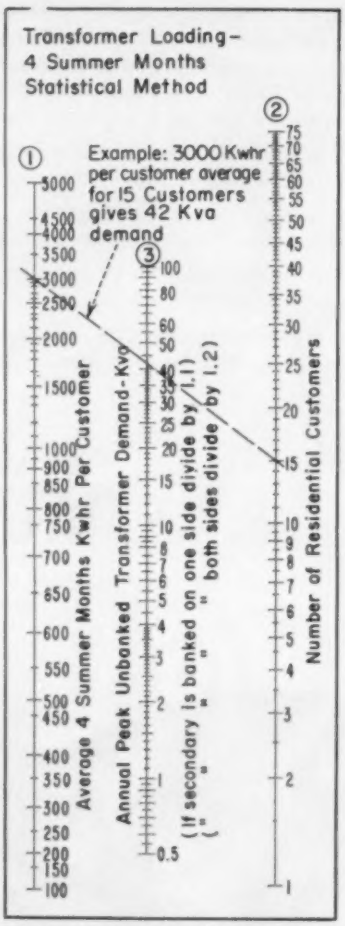
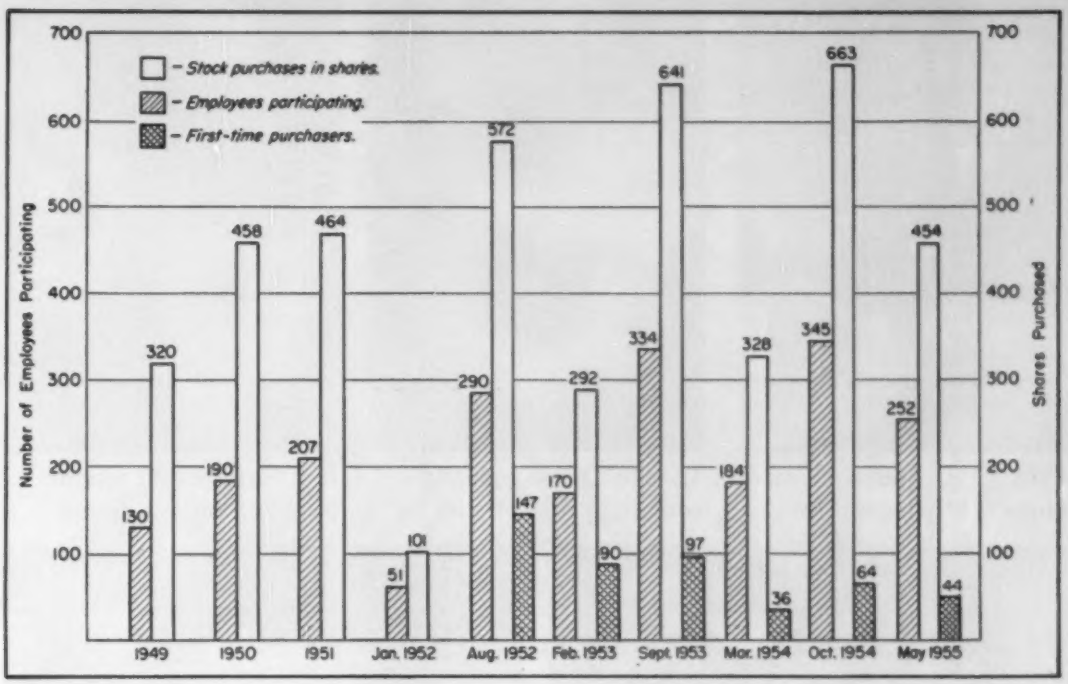

Transformer Loading-
4 Summer Months
Statistical Method
Example: 3000 Kwhr per customer average for 15 Customers gives 42 Kva demand
Average 4 Summer Months Kwhr Per Customer
Annual Peak Unbanked Transformer Demand-Kva
(If secondary is banked on one side divide by 1.1)
(" " " both sides divide by 1.2)
Number of Residential Customers

FIG 4—ALIGNMENT CHART combines steps and charts for simplification



MANAGEMENT—Finance

Idaho Power Employees Buy Shares

Company claims industry record as 70% of staff become shareowners after six years of stock offerings, but sets its sights on 100% employee ownership

Among electric utilities with employee shareowner plans, Idaho Power Co has chalked up an enviable record —probably the best in the industry. The company's last offering of shares in May took employee participation up to the 70% mark, a big jump from the 25% participation when the program started in 1949.

The fact that the percentage ownership has improved to such a high figure is taken as a sign that the program is a success, says the company. However, continuous efforts are being made toward the ultimate goal of attaining 100% employee ownership at some time in the future.

Growth Has Been Gradual . . . The accomplishment of improving percentage ownership from the 1949 figure has been gradual. By 1952 it had been raised to 45%, and in 1953 to 54%. Before the May offering it had been taken up to 68%. The company is pleased both with the number of new purchasers at each offering as well as the number of repeat buyers.

In 1949 when it was decided that a program should be instituted, a letter was written to each of the division managers and other department heads advising them that the company's 4% preferred stock, par value $100, would be offered to employees on a monthly payroll payment plan. Arrangements were made with the Boise branches of two banks serving the territory for handling the employees' loans for stock purchases.

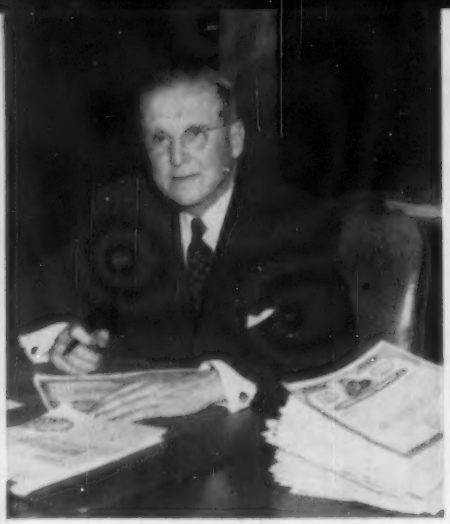
Terms Made Easy . . . A down payment of $10 a share was to be made in cash and the balance of $90, plus $2.92 interest which was computed at the rate of 6% on the unpaid monthly balances, was to be covered by a note to be given to one of the banks in payment for the balance. This note was to be cleared by 11 monthly payments of $7.50 a share, together with a final payment of $10.42 a share which would include the $2.92 interest.

Of the total 975 full-time employees at that time, 130 signed purchase requests for 320 shares.

From the beginning there has been no attempt to pressure employees into buying company stock. Aside from the introductory letters in the beginning, the principal sales method used has been by means of discussions and information passed verbally through supervisory groups merely pointing out the values to the individual and attempting to create a desire to own the stock rather than a feeling that it must be owned.

Reasons for Success . . . The company attributes the success of the program to the following factors:

1. The offers have been made regularly since the beginning of the program. The only variation has been a change in the terms of the offers. The original $10 cash down payment



Pres T. E. Roach signs stock certificates for . . .

Lorena Dillon, stenographer in advertising . . .

Joe Garmendis, repeat buyer of service group . . .

planning and engineering group . . .

and addressograph and mailing group

was found to be a stumbling block. So, in 1951 it was agreed to allow employees to make a $10 down payment deductible from the employee's payroll check with the regular deductions to follow. This extended the period from 12 months to 13 payroll months. Accordingly, each year the new offer comes about one month later. There are no lapses of time between offers, and employees gain through the regularity of deductions.

2. The payroll deduction plan has been made convenient enough so that once an employee has signed up for a certain number of shares the payroll clerk automatically enters the appropriate deduction each month and the employee is advised of this amount on the stub of his payroll check.

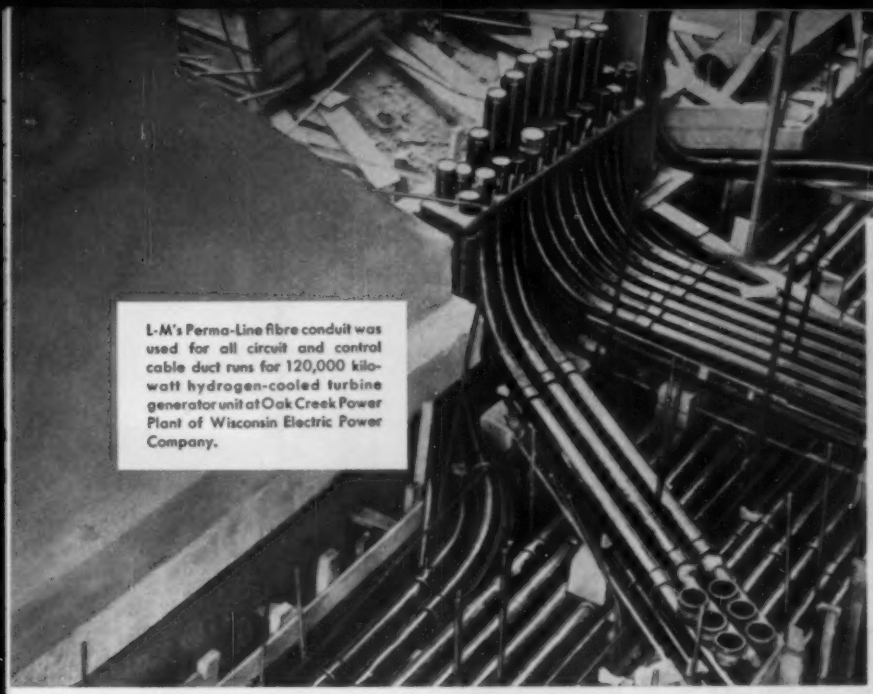
3. The interest rate applied to the funds borrowed from one of the banks is quite reasonable, being 6% on the reducing balances, and amounts to only $2.92 for the 12-months period of the note. Arrangements have been made with the banks so that there are no penalty charges or other expenses involved if an employee desires to pay off his note at any time.

4. Under the program the stock is purchased in the name of the employee immediately, thereby placing his name on the company's stock records and entitling him to regular dividends. Thus the employee will receive $4 in annual dividends during the time the payments are being made —more than paying the interest charges on his payments in the first year.

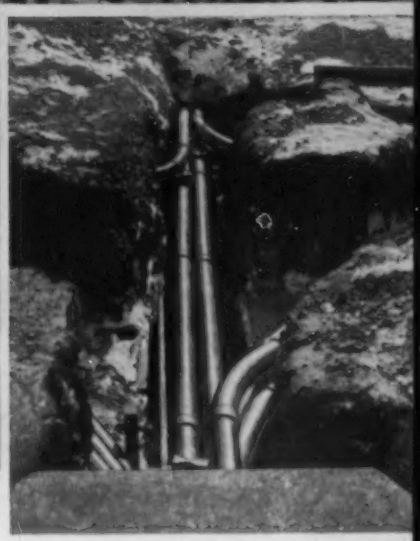
5. Another reason why percentage employee ownership has improved so rapidly is the group stimulus. Each of the responsible groups, such as sales, accounting, machine shop, drafting, etc., is counted separately and percentage of ownership reported to management. This creates an interest within the group to gain 100% rating, and over a period of time the employees in each group discuss the subject frequently enough to build up an interest among those who do not own stock. This acts as a stimulus to the latter to buy stock and give the group 100% rating.

No Pressure Used . . . The company stresses the point that at no time is pressure used on any individual to make him feel he must own company

(*Continued on page* 43)



L-M's Perma-Line fibre conduit was used for all circuit and control cable duct runs for 120,000 kilowatt hydrogen-cooled turbine generator unit at Oak Creek Power Plant of Wisconsin Electric Power Company.



L-M's Perma-Line™ Conduit Assures a Lifetime of Trouble-Free Service

L-M's Perma-Line fibre conduit is manufactured within close tolerances and according to rigid test requirements to assure trouble-free service for all generating station, substation, and underground system applications.

L-M's Perma-Line is corrosion-, vermin-, and leak-proof. It has an unusually high tensile strength. Joints are quickly and easily made by simply tapping the tapered coupling onto the tapered end of the conduit. Joints are watertight and safe from seepage of wet concrete and soil water. L-M conduit's smooth inner bore makes cable easier to pull and reduces cable sheath abrasion. Fibre conduit comes in long lengths. It's light, easy to handle; and you'll find it can be laid faster than many other types of ducts.

Complete Accessories

Prefabricated base and intermediate spacer units are available to keep installations rigid and evenly aligned. Spacers have special locking feature to make any combination of duct configuration.

L-M provides a variety of bends and angle couplings, including 5° angle coupling, S-bend, 45° and 90° bends. The 5° angle coupling provides for long radius turns and offsets; S-bend provides a 20" offset. Special bends are available on order.

Bell ends for use at conduit terminals in manholes provide a smoothly rounded opening that will not cut or mar the cable sheath.

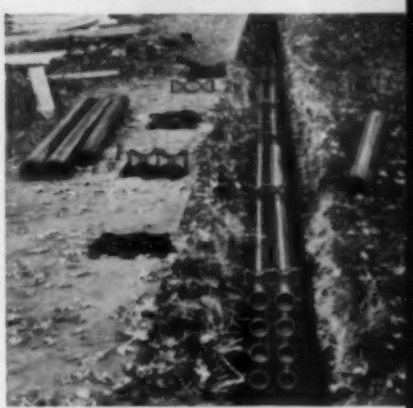
Fibre caps provide a watertight, vermin-proof seal for conduit lines prior to drawing cable. Easy to remove for reuse.

L-M Perma-Line fibre conduit is available in 5-foot lengths, sizes 2, 4, 5, and 6 inches; also 8-foot lengths, sizes 3, 3½, 4, 4½ and 5 inches.

Get Complete Information

L-M offers a completely engineered system for conduit installations. Ask the L-M Field Engineer for a copy of the 12-point plan folder, which shows how easy it is to use our system; also for L-M's underground construction handbook and Bulletin UG1A, which gives complete specifications. Or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

'Above, L-M's Perma-Line fibre conduit is being installed in the Burleigh Substation, Wisconsin Electric Power Co. Duct has smooth inner bore and smoothly rounded bell ends in manholes so cable sheath will not be cut or marred.

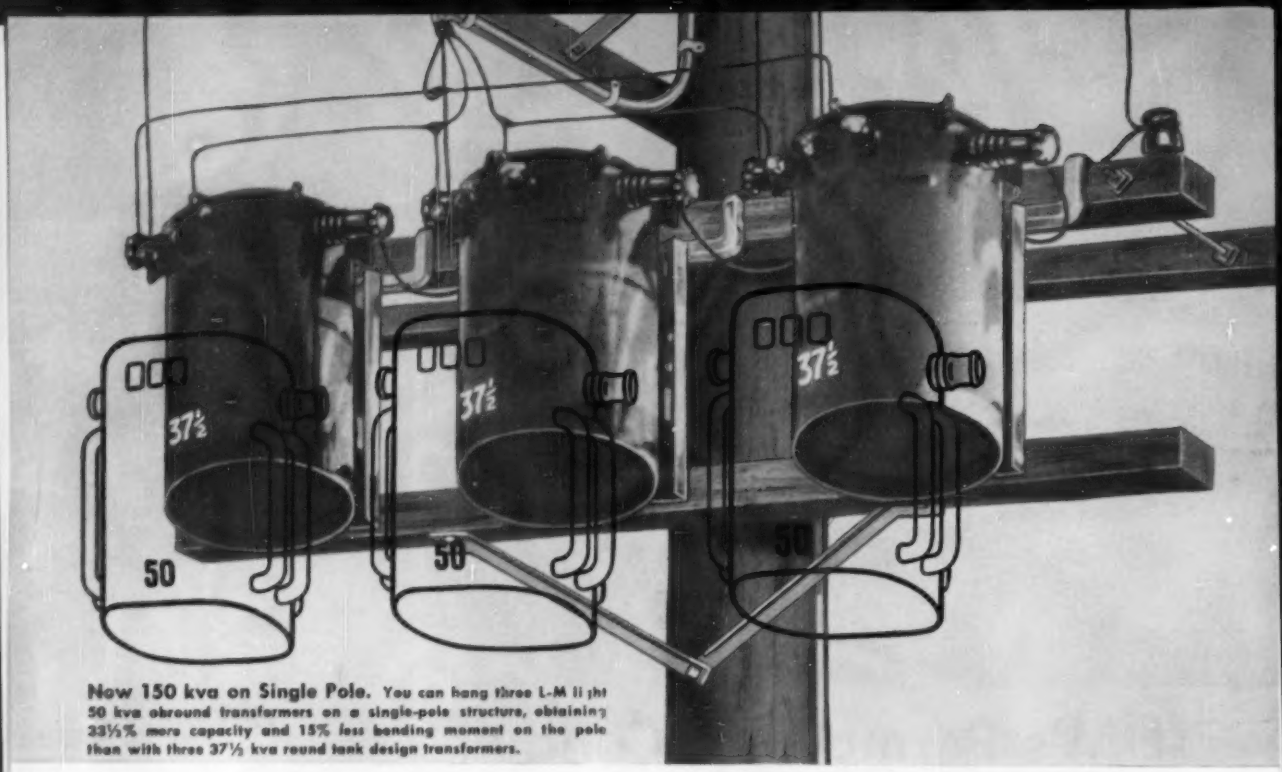


It is easy to construct a solid, well-aligned installation with L-M's Perma-Line fibre conduit and easy-to-use accessories. The illustration above shows use of L-M base and intermediate spacers, to assure firm, even spacing.

L-M's new tapering tool and fibre conduit vise duplicates the smooth, precision factory-cut tapers in the field. It pays for itself through savings from 100% salvage of field-cut ends.

LINE MATERIAL

Fibre Conduit



Now 150 kva on Single Pole. You can hang three L-M light 50 kva obround transformers on a single-pole structure, obtaining 33⅓% more capacity and 15% less bending moment on the pole than with three 37½ kva round tank design transformers.

How L-M Obround Design Provides Additional Capacity On Structures

New obround tank design is smaller, lighter, has shorter moment arm, retaining all outstanding Round-Wound® performance characteristics.

By **ALVIN B. COYLE**
Manager
Transformer Sales
Line Material Company

Now you can hang transformers of larger capacity on a pole structure with L-M's lighter, smaller obround transformer tank design. The additional capacity is obtained without changing outstanding performance characteristics of L-M's Round-Wound design.

Less Weight

The obround design provides a smaller tank with less transformer oil, resulting in a lighter, easier-to-handle transformer. Cooling tubes are installed where necessary to provide the cooling surface for maintaining the same low hot-spot and top oil temperature-performance characteristics found in all other L-M transformers. In addition, the transformer's repetitive overload capacity is improved as the result of the faster transfer of heat from the coils to the cooling air.

Shorter Moment Arm

L-M's new obround design brings the center of gravity closer to the pole, which reduces the moment arm distance from the pole. The combination of lighter weight and less moment arm distance substantially decreases the total bending moment on the pole and crossarms, and thus greatly increases the potential capacity of all your transformer structures.

You can take advantage of savings such as these:

Larger transformers can be hung closer to the top of the pole, eliminating the need for a higher pole and additional spacing.

Single-pole, three-phase transformer structures can now serve more load with the additional transformer capacity available. New 50 kva obround transformers have less bending moment on the pole and on crossarms than previous 37½ kva round tank design. Here L-M's light obround transformers may eliminate the need for costly two-pole structures.

Pole-Mounted 167 kva Transformers

L-M's light-weight 167 kva transformer can be pole-mounted; provides a full 167 kva of capacity on a single-pole structure. And it, too, provides L-M's well-known overload capacity.

To serve three-phase loads you can hang three L-M light 167 kva transformers or 500 kva on a two-pole structure, eliminate expensive platforms, ground pads, or vaults in many instances, and make further use of existing facilities.

L-M's light, obround design transformers are available in single-phase 5 kva through 167 kva in each standard distribution voltage class.

Get Details On Lighter-Weight Obround Transformers

Ask the L-M Field Engineer for application information, weights and dimensions on L-M obround transformers and the exclusive Round-Wound design. Or write Mr. Coyle at Line Material Company, Transformer Division, Zanesville, Ohio (a McGraw Electric Company Division).

LINE MATERIAL Transformers

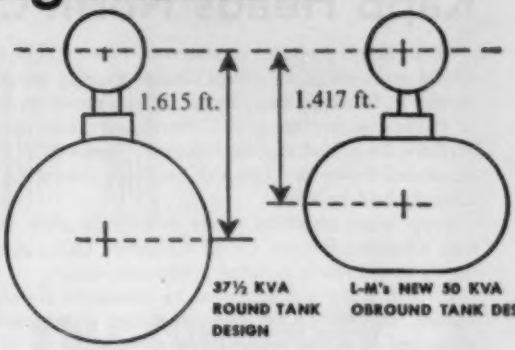
You Can Hang 33⅓% More Capacity With 15% Less Bending Moment

COMPARE 37½ kva round tank design
50 kva L-M obround tank design

37½ kva ROUND tank design:
Moment arm from center of pole. 1.615 ft.
Weight . . . . . 800 lbs.
Bending moment 800 x 1.615 . . . . **1292 ft.-lbs.**

50 kva L-M OBROUND tank design:
Moment arm from center of pole. 1.417 ft.
Weight . . . . . 775 lbs.
Bending moment 775 x 1.417 . . . . **1098 ft.-lbs.**

L-M's new 50 kva obround transformer has 15% less bending moment than the 37½ kva round tank design.



Less Bending Moment—New obround tank design reduces the moment arm distance from the pole. The combination of lighter weight and smaller moment arm distance greatly decreases the total bending moment on the pole. When crossarm mounted, the lighter weight substantially reduces the bending moment on the crossarms.

Less Weight, Faster Cooling—The obround design affords a small tank and less transformer oil, resulting in a lighter, easier-to-handle transformer. Cooling tubes are installed where required to provide sufficient cooling surface.

In addition, oil ducts, located throughout the coil and between the coil and cruciform cross-section of the wound core, contribute to uniform efficient cooling.

Rapid transfer of heat provides faster cooling of the unit, increasing its repetitive overload capacity.

Plus Outstanding Round-Wound Performance Characteristics

Both the physical and performance characteristics of L-M's obround tank transformer were considered in detail. The advantages of lighter weight and shorter moment arm were accomplished with no sacrifice of outstanding Round-Wound performance characteristics.

Low Exciting Current: the continuously wound core of oriented-grain silicon steel strip provides a uniform flux path, thus permitting low exciting current.

High Impulse Strength: high-voltage windings are on the outside of the coils, providing maximum distance between the high-voltage windings and the core. This permits ample creepage distance with generous insulation.

High Short-Circuit Strength: round coils naturally resist radial short-circuit forces without damage or distortion. Sturdy core clamps and strong blocking aid in preventing axial movement of the windings under short-circuit conditions.

High Short-Time Overload Capacity: cruciform cross section of wound core and ducts between windings and layers provide excellent cooling for the entire unit.

Now you can hang 167 kva directly on the pole, yet L-M's new lightweight obround has full 167 kva continuous rating and no sacrifice in overload capacity.

LINE MATERIAL

Transformers

219c

Kapp Heads North Central Electric Association

M. L. KAPP

M. L. Kapp, president of Interstate Power Co of Dubuque, Iowa, has been elected president of the North Central Electric Association. He succeeds J. F. Owens, Jr, Northern States Power Co vice president, as head of the organization of utilities serving Minnesota, North and South Dakota, western Wisconsin, northern Iowa, and eastern Montana. Howard W. Cooper, vice president of Minnesota Power & Light Co, has been named to the vice president's post formerly held by Kapp.

Kapp began his utility career in 1918 as office assistant and meter reader with Chandler Electric Co of Chandler, Okla. After attending Tulsa University he became a certified public accountant.

In 1920 Kapp was employed by Oklahoma Natural Gas Co as a traveling auditor. In 1936 he resigned as assistant to the gas company's vice president to become operating superintendent and a director of Michigan Public Service Co. He was made a vice president in 1938.

Joining Interstate Power Co in 1939 as assistant to the president, Kapp was elected a director within a year. He was made vice president in 1945, executive vice president in 1949, and president in 1953.

H. L. SMITH, JR

Smith Elected Alcoa Sales VP

Alumium Co of America has elected Harry L. Smith, Jr, staff manager of product sales since 1952, as sales vice president. Smith will direct Alcoa's New Kensington and Cleveland Sales Development Divisions and the company's Division of Commercial Research.

Smith was on leave from Alcoa to serve in Washington from July 1953 to May 1954. He was director of the Aluminum Division of the National Production Authority and assistant administrator of the Business and Defense Services Administration of the Commerce Department.

A graduate of Wharton School of Finance and Commerce at the University of Pennsylvania, Smith joined Alcoa in 1914 to take the sales apprentice course. He served in various sales managerial capacities, becoming product manager for castings and forgings sales in 1938, castings sales exclusively in 1940, and sheet sales in 1944.

Chase Brass Advances Gulliksen

J. W. GULLIKSEN

Chase Brass & Copper Co has elected J. Walter Gulliksen vice president of its Waterbury Manufacturing Co Division. General manager of that division since he joined Chase in October 1954, Gulliksen as vice president will retain responsibility for production and sales.

A mechanical engineering graduate of Stevens Institute of Technology, he has done post graduate work in commercial law and salesmanship, industrial personnel management, and metallurgy.

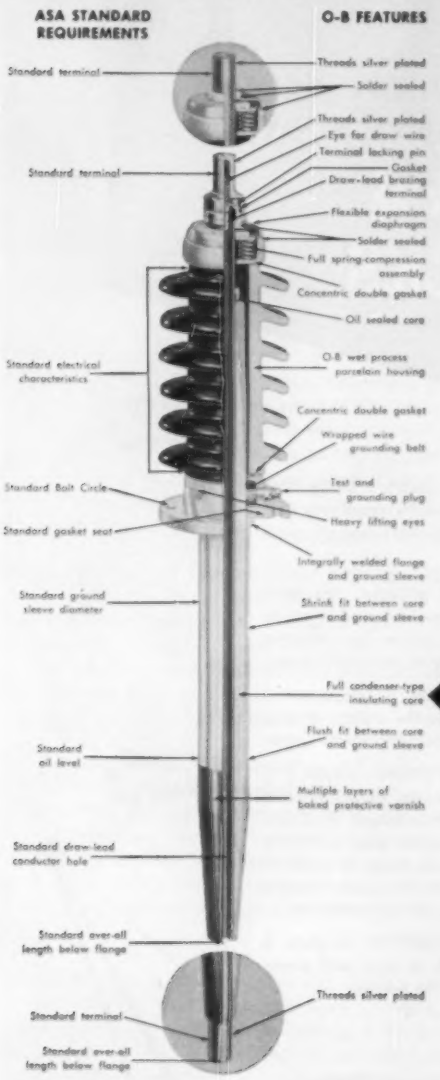
After culminating 15 years with Aluminum Co of America as a factory superintendent, Gulliksen joined Worcester Pressed Steel Co in 1942 as assistant to the general manager. Elected a director, he served as general superintendent and, later, factory manager.

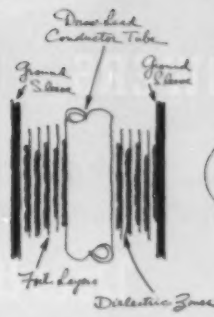
Well known for his work on the deep drawing of titanium, he was a delegate to the World Metallurgical Congress, held in Chicago in 1951.

FEATURES OF

O-B'S NEW ASA STANDARD BUSHINGS

(Drawn-lead transformer type in full view. Fixed conductor type in insets)





FULL CONDENSER CORE CONSTRUCTION

Uses All the Insulation ... Abuses None of It!

Voltage division between series-condensers of uniform capacitance is equal.

To exploit this desirable property, the insulation of the new O-B bushing core consists of wound paper, broken into multiple zones of uniform capacitance by the insertion of numerous foil condenser plates. As a consequence, the dielectric component is divided into a series of uniformly-graded insulating layers, each carrying an equal and extremely moderate electrical stress.

Using *all* the insulation, and abusing *none* of it, is one of the many features of O-B's new bushings. Neither material nor design of a core is specified by the ASA Standard. The manufacturer has full choice of how he makes his product. Full condenser core construction is just one of many added values you get when you specify O-B ASA Standard bushings.

TECHNICAL COMPETENCE

the heart of every *Ohio Brass* bushing

4826-H

POWERS-American

Series 450 CONSTRUCTION AND OVERHEAD MAINTENANCE BODY

Does the Work of TWO TRUCKS

Ladder can be revolved 360° at elevations from 30° to 75°. In 23'6", 26'6", and 30'6" mechanical units, or 35' hydraulic model.

Body is 108" long, for installation on dual-rear wheel chassis having cab-to-axle dimension of approximately 60"

Here's a multi-purpose body that does work normally requiring two or more specially-equipped vehicles.

FOR OVERHEAD WORK . . . the body has a Powers-American mechanical or hydraulic Aerial Ladder, in a working height best suited to individual needs.

FOR SERVICE WORK . . . compartments provide space for the orderly storage of a wide assortment of tools and parts.

FOR CONSTRUCTION WORK . . . simplified, easy-to-use derrick handles poles up to 35 ft. in length. A 10,000 lb. underslung winch pays out cable beneath the body floor. A universal swivel sheave permits winch line pull in any direction, without limitation.

COMPLETE DESCRIPTION is given in Bulletin No. 118. A copy, with quotation, is yours for the asking.

Derrick utilizes flexible steel cable instead of conventional center leg. Stows in loading area rack when not in use.

POWERS-AMERICAN DIVISION
McCABE-POWERS
AUTO BODY COMPANY
5900 No. Broadway • St. Louis 15, Missouri

H. K. COLLINS

Collins Manages Budd Co Subsidiary

Harry K. Collins, vice president of the former Continental-Diamond Fibre Co since 1952, has been elected vice president and general manager of the recently formed Continental-Diamond Fibre Division of The Budd Co, Inc. He will serve as chief administrative officer of the new Budd subsidiary (EW, July 11, p 187).

A graduate mechanical engineer, Collins joined General Electric Co in 1926 as a student engineer in the manufacturing training course. After serving as superintendent of the mica and insulation department, general manager of the plastics department, and general manager of laminated and insulating products department, Collins left GE in 1952 to become director of manufacturing for Continental-Diamond.

During World War II he was a member of National Production Authority's Advisory Committee and a task group for mining domestic mica.

PERSONAL BRIEFS

Palmetto Electric Cooperative, Inc, Ridgeland, S. C., has named **Jeter Harrell** acting manager of the co-op to succeed **J. Morton Perry . . . Sam Morgan,** assistant manager of Dickens County Electric Cooperative, Inc, Spur, Tex., has been selected the new manager of Fannin County Electric Cooperative of Bonham, Tex. Morgan replaces **Joe Adair** who has resigned.

Claude L. Lewis has been promoted to budget director of Toledo Edison Co, succeeding **Alex W. Morgan** who has retired after 46 years with the utility. Lewis has been assistant to the budget director since 1949 . . . Gov Lane Dwinell has announced his decision to nominate **Harold K. Davison** for another term as chairman of the New Hampshire Public Utilities Commission.

General Electric Co's Measurements and Industrial Products Division has named **Joseph T. Bailey** general manager of its outdoor lighting department. Bailey had been manager of marketing, industry control department, at Schenectady. **Frank M. Mansfield III,** manager of product programming, has been appointed manager of product planning and marketing research for Carboloy Department of GE.

Donald S. Walker, vice president and director of sales of Combustion Engineering, Inc, has been elected a director of the company . . . Minnesota Mining & Manufacturing Co has promoted **C. C. March** from manufacturing manager to general manager of the Coated Abrasives and Related Products Division and **R. W. Mueller** from general sales manager of that division to general manager of the Fibrous and Industrial Tape Division.

Lapp Insulator Co, Inc, has named **John F. Innes** sales manager of the Insulator Division . . . **John F. Garde, Jr,** has been admitted as a partner of Sanderson & Porter, New York City engineering firm . . . The Bristol Co has promoted **Ernest Nuber** from sales manager to general field sales manager . . . **Elwood H. Rogge** has been appointed local manager of Leeds & Northrup Co's new plant at North Wales, Pa., in addition to his present duties as assistant production manager of the company.

Joseph H. McConnell, a director of Reynolds Metals Co, has become general counsel to succeed the late **R. B. Patterson.** McConnell has resigned as president of Colgate Palmolive Co . . . **Dr. Chauncey Starr,** director of North American Aviation, Inc's atomic energy research and development program, has been elected vice president in charge of the company's new Nuclear Engineering and Manufacturing Division.

Consolidated Edison Co of New York, Inc, has named **A. Bryan Marvin** assistant director of its public information bureau. Engaged chiefly in press relations, he has been on the bureau's staff since 1946.

Dorsey F. Hughes, assistant to manager, electric system, Potomac Electric Power Co, has been appointed assistant electrical engineer . . . West Penn Power Co has promoted **Robert A. Mycoff** from power department operations engineer to manager of power production.

Westinghouse Electric Corp has announced the retirement of **Porter H. Brace,** consulting metallurgist to its research laboratories. In his 42 years with Westinghouse Brace has been granted 57 patents and has produced a group of versatile metal alloys for use in the electrical industry.

OBITUARY

Binkley D. K. Bobbitt, 56, district manager for Kentucky Utilities Co, died June 25 at Versailles, Ky.

W. Gordon Copeland, 66, retired contract engineer for Central Illinois Public Service Co, died at Springfield, Ill., June 30.

Edward L. Stack, treasurer of Delaware Power & Light Co, died July 2 at Wilmington, Del.

James F. Spicer, 55, district manager for Hubbard & Co in Virginia, the Carolinas, and a section of West Virginia, died June 26 at Richmond, Va.

Super power transformers pace utility expansion

Breaking the Barriers of High Voltage Transmission

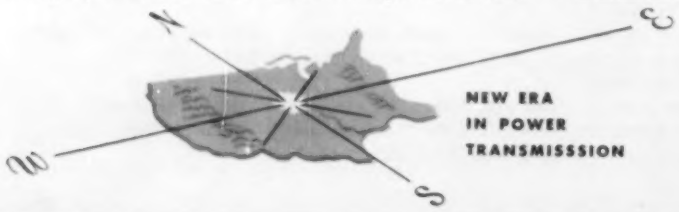
THIS 330,000-volt, 125,000-kva power transformer is the first of four of this rating being built by Allis-Chalmers for the Clifty Creek Plant of the Indiana-Kentucky Electric Corporation and the Pierce Switching Station of the Ohio Valley Electric Corporation. These four autotransformers will serve as part of the highest voltage transmission system now operating in the country.

The two companies are completely new utilities, formed by the combined efforts of 15 privately owned power companies to supply the power needs of a new atomic plant in Ohio. They represent a unique contribution by America's power companies to industrial progress.

Enormous transformers like these are examples of the type of equipment needed by utilities to serve ever-increasing power needs. Allis-Chalmers has consistently set the pace in development of power transformers for utility systems all over the country. Here are a few of the features of this power transformer worth special note:

- Allis-Chalmers developed *Electro-Coolers* are mounted nine feet above the foundation line so that possible flood crests cannot interfere with effective operation of the unit.
- Like every Allis-Chalmers power transformer, this unit is corona-free. Regardless of its large size, the creeping deterioration of corona will never shorten this transformer's effective operating life.
- New techniques for welding aluminum, developed by Allis-Chalmers specially for power transformers, reduce weights of end frames considerably. Although structural strength has not been affected, shipping and installation will be far easier.

An Allis-Chalmers representative will be glad to talk over these and other new transformer developments with you at your convenience. Call the nearby A-C office or write Allis-Chalmers, Milwaukee 1, Wisconsin. A-4771



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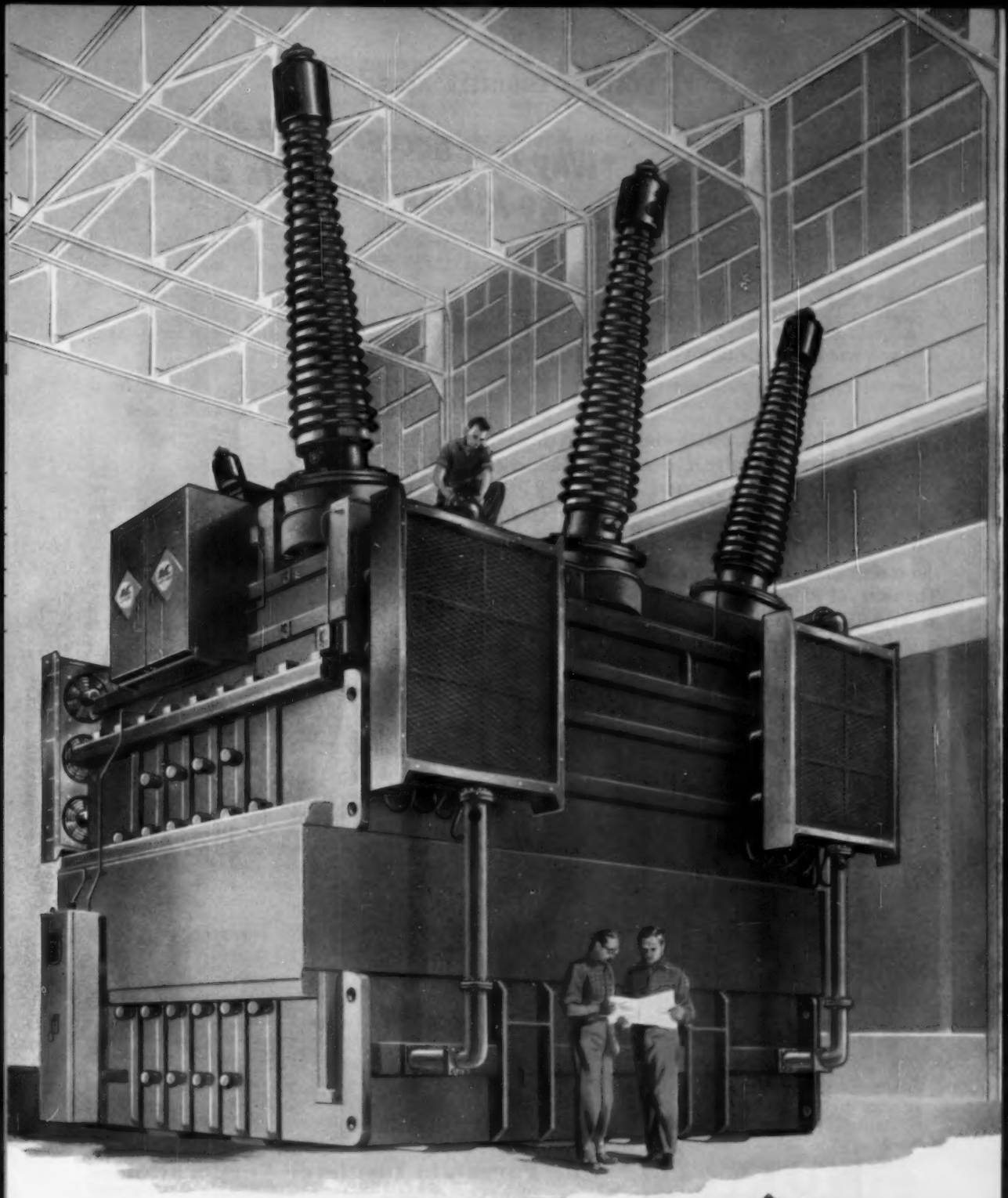
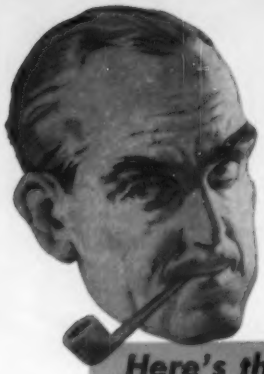


CHALMERS



A STATION ENGINEER ASKS—

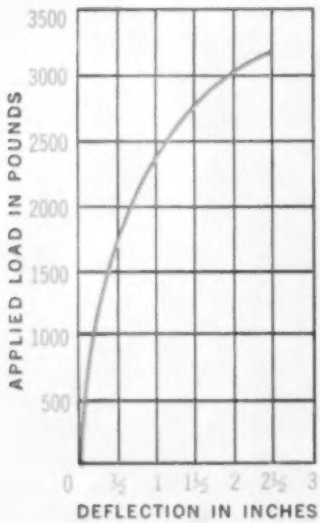
"Why is it necessary to shim 69 K.V. switch units ?"

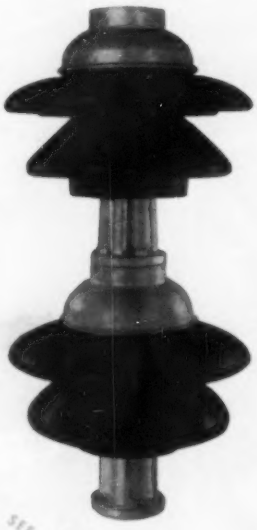
Here's the ANSWER: *You don't have to when you use Pinco L-6069 Switch and Bus Units.*

Here's WHY:

The Pinco L-6069 Switch and Bus Unit employs a ribbed malleable iron pin to give it the rigidity and strength required in this unit's application.

Here's the PROOF: The deflection curve below shows the rigidity of the Pinco L-6069 Switch and Bus Unit under various loads. The secret of Pinco's perfect alignment even when horizontally mounted, lies in the balanced design of the porcelain and hardware.





SPECIFICATIONS

PINCO L-6069 SWITCH and BUS UNIT

Cantilever Strength, upright (Base mounted)	1500 lbs.
Cantilever Strength, underhung (Cap mounted)	1000 lbs.
Torsion Strength	15,000 inch lbs.
Tension Strength	12,000 lbs.

This Unit More Than Meets The Above Ratings

SEE PAGE 116, PINCO CATALOG NO. 49 FOR COMPLETE ELECTRICAL AND MECHANICAL CHARACTERISTICS

PINCO INSULATORS

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MEETINGS CALENDAR

An extended list of coming meetings appears in the last issue of each month

AUGUST

NATIONAL SHADE TREE CONFERENCE—31st Annual Convention, Mar Monte Hotel, Santa Barbara, Calif., Aug. 1-5.

SOUTHEASTERN ELECTRIC EXCHANGE—Personal Administration Section, Roanoke Hotel, Roanoke, Va., Aug. 11-12.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS—Pacific General Meeting, Butte, Mont., Aug. 15-19.

STANFORD RESEARCH INSTITUTE—Symposium on Electronics in Automatic Production, Sheraton-Palace Hotel, San Francisco, August 22-23.

WEST COAST ELECTRONIC MANUFACTURERS' ASSOCIATION — 1955 Wescon Show, Fairmount Hotel, San Francisco, August 24-26.

SEPTEMBER

SECOND WESTERN AREA DEVELOPMENT CONFERENCE—sponsored jointly by Stanford Research Institute, the American Industrial Development Council, and the Pacific Northwest Trade Association, Multnomah Hotel, Portland, Ore., Sept. 8-9.

ROCKY MOUNTAIN ELECTRICAL LEAGUE—Annual Fall Convention, Grand Teton Lodge, Jackson Hole, Wyoming, Sept. 11-14.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS—2nd Electrical Conference of the Petroleum Industry, Shamrock Hotel, Houston, Texas, Sept. 12-14, Industrial Electronics Conference, Rackham Memorial Auditorium, Detroit, Michigan, Sept. 28-29.

ILLUMINATING ENGINEERING SOCIETY — National Technical Conference, Cleveland, Sept. 12-16.

INSTRUMENT SOCIETY OF AMERICA—10th Annual Conference and Exhibit, Shrine Exposition Hall and Shrine Auditorium, Los Angeles, Sept. 12-16.

EDISON ELECTRIC INSTITUTE — Accounting Division Organization Meeting with American Gas Association, Netherlands Plaza Hotel, Cincinnati, Sept. 13-14; Industrial Relations Round Table Conference, Drake Hotel, Chicago, Sept. 19-21; Industrial Power & Heating Group, EEI Headquarters, New York, Sept. 22-23; Purchasing and Stores Committee, EEI Headquarters, New York, Sept. 26; Transmission and Distribution Committee, Jung Hotel, New Orleans, Sept. 29-30.

ASSOCIATION FOR COMPUTING MACHINERY—Annual Meeting, University of Pennsylvania, Sept. 14-16.

PUBLIC UTILITIES ASSOCIATION OF THE VIRGINIAS—37th Annual Meeting, Greenbrier Hotel, White Sulphur Springs, West Va., Sept. 15-18.

SYMPOSIUM OF ELECTRONIC AUTOMATION—University of Pennsylvania, Irvine Auditorium, Philadelphia, Sept. 19-20.

SOCIETY OF INDUSTRIAL PACKAGING AND MATERIALS ENGINEERS—10th Anniversary Meeting, Kingsbridge Armory, New York, Sept. 19-22.

PENNSYLVANIA ELECTRIC ASSOCIATION—Annual Meeting, Benjamin Franklin Hotel, Philadelphia, Sept. 20-21.

*__NATIONAL INDUSTRIAL CONFERENCE BOARD__ — Marketing Meeting, Waldorf-Astoria Hotel, New York, Sept. 21-23.

MISSOURI VALLEY ELECTRIC ASSOCIATION—Accounting Conference, President Hotel, Kansas City, Mo., Sept. 22-23.

SOUTHEASTERN ELECTRIC EXCHANGE—Engineering & Operation Section, and Subcommittees, Charlotte Hotel, Charlotte, N. C. Sept. 22-23.

NATIONAL ASSOCIATION OF ELECTRICAL DISTRIBUTORS—Pacific Zone, Annual Convention, Empress Hotel, Victoria, B. C., Sept. 25-28.

STANDARDS ENGINEERS SOCIETY—4th Annual Meeting, Hotel Statler, Hartford, Conn., Sept. 29-Oct. 1.

OCTOBER

EDISON ELECTRIC INSTITUTE—Meter & Service Committee, Hotel Syracuse, Syracuse, N. Y., Oct. 3-5; Prime Movers Committee, Hotel Cleveland, Cleveland, Ohio, Oct. 3-5; Electrical Equipment Committee, Shoreham Hotel, Washington, D. C., Oct. 17-18.

ELECTRIC COMPANIES PUBLIC INFORMATION PROGRAM—Workshop Conference, Chase-Park Plaza Hotels, St. Louis, Mo., Oct. 5-7.

SOUTHEASTERN ELECTRIC EXCHANGE—Accounting Conference, Hotel San Carlos, Pensacola, Fla., Oct. 20-21; Sales Conference, Biltmore Hotel, Atlanta, Ga., Oct. 27-28.

NATIONAL ASSOCIATION OF RAILROAD AND UTILITIES COMMISSIONERS—67th Annual Convention, Grove Park Inn, Asheville, N. C., Oct. 24-27.

PENNSYLVANIA ELECTRIC ASSOCIATION—Electrical Equipment Committee, Hotel New Yorker, N. Y., Oct. 27-28; Relay Committee, Pocono Manor Inn, Pocono Manor, Pa., Oct. 31-Nov. 1.

NOVEMBER

EDISON ELECTRIC INSTITUTE—Taxation Accounting Committee, sponsored jointly by American Gas Association and the Edison Electric Institute, Plaza Terrace Hotel, Cincinnati, Ohio, Nov. 3; Accident Prevention Committee, Beaumont Hotel, Beaumont, Tex., Nov. 13-18.

* Additions this week.

Idaho Power Employees Buy Shares

(*Continued from page* 32)

stock. It is felt that such urging would be detrimental to the program and certainly would not gain the results desired by the management.

Since the beginning of the program in June, 1949, employees have purchased about 4,000 shares on the deferred payment basis. A few of these shares naturally have been disposed of by employees in order to meet certain obligations, but undoubtedly the largest portion of these securities is still retained by them. It is believed that this has created beneficial savings habits and helped the employees to build up estates in a manner which has been convenient and, to a certain degree, painless.

In addition to the above, it is known that the program has created more of a desire to own company securities than previously existed, because each time that a sale or offer is made many of the employees will make cash purchases of stock in addition to their payroll deduction purchases. For instance, with the February, 1953 offer, 170 employees signed up for 292 shares but 110 additional shares were purchased for cash.

New Office Building

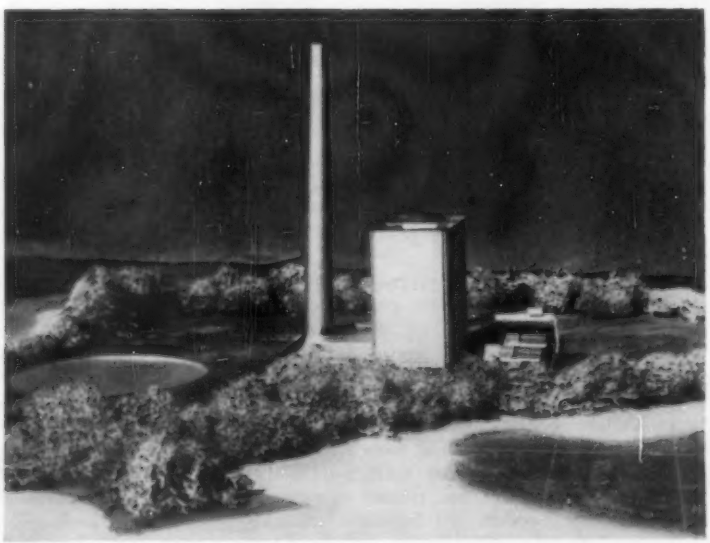
Construction of West Penn Power Co's new general office building (shown in artist's sketch) is underway on a wooded hill just north of Greensburg, Pa. When completed in December, the building, designed for efficiency as well as eye-appeal will accommodate 600 employees.

Beauty Is as Beauty Does

Cooling Lake

Carolina Power & Light Co's recently completed cooling lake below its Lumberton Plant has made a hit with nature lovers. The 210-acre, man-made lake provides a scenic attraction in the area and prevents harm to fish by cooling the water released by Lumberton's steam condensers. In addition, company spokesmen pointed out, the lake will facilitate future plant expansion.

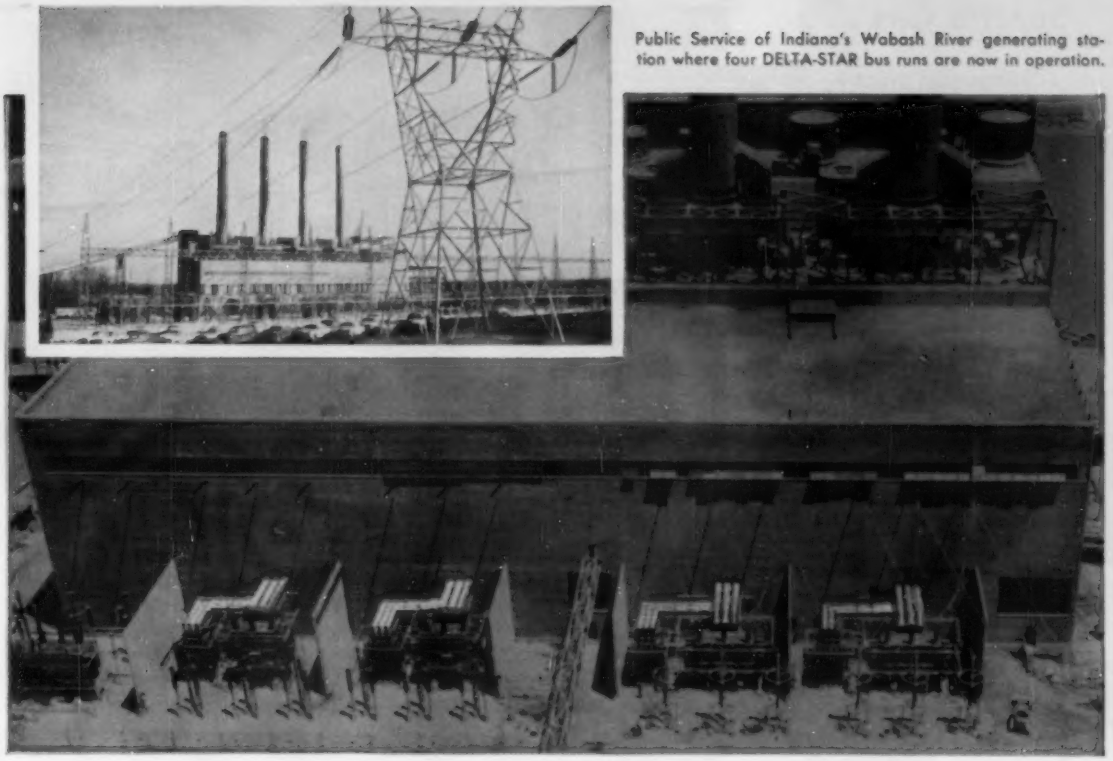
"Best-looking" Plant Meets Landowner Opposition



Considerable opposition met building plans for Connecticut Light & Power Co's "best-looking electric generating plant in America" at recent hearings before the state Public Utilities Commission. A scale model (left) of the plant was displayed by the utility to subdue opposition.

Principal foes of the $20-million, 100,000-kw project, slated for construction in 1960 on Manresa Island in Norwalk harbor, were landowners of Wilson's Point, a 23-acre tract of shorefront estates across the bay from the island. They feared that an industrial plant would spoil their view of the sea and sand.

Sherman R. Knapp, CP&L president, contended that no other suitable land is available for the plant which must be built to meet increasing power demand in the area.



Public Service of Indiana's Wabash River generating station where four DELTA-STAR bus runs are now in operation.

Success is contagious

With success comes satisfaction. Satisfaction leads to more of the same.

That's why this example of satisfaction with Delta-Star equipment has a specific meaning for you. That applies particularly if you are not now using Delta-Star's services and equipment.

Four Delta-Star bus runs carry peak load

At Public Service of Indiana's Wabash River generating station, four main generator bus runs recently carried an all-time peak load of 400,000 kw. All four are Delta-Star isolated phase bus runs.

Fifth to carry additional 125,000 kw

Expanding again, Public Service of Indiana recently ordered a fifth Delta-Star bus run. This is typical of customer satisfaction with Delta-Star equipment—satisfaction originating from users' success with Delta-Star's high quality products, engineering assistance and service.

This kind of satisfaction may readily be yours. Just call on Delta-Star. Start by writing for Bulletin 5006-B.

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Seattle Gas . . .

. . . announces plans to capture 20% of heating sales; PUDs say market big enough for all

Goal of the Seattle Gas Co to supply 20% of the heating market within five years after natural gas has become available in the Pacific Northwest was announced recently by J. Wilson Gaw, the company's public relations director.

The announcement, made at the semi-annual meeting of the Washington PUD Association in Seattle, attracted considerable attention for natural gas is scheduled to reach the state next year and will compete with electricity.

The heating load is particularly important to PUDs in eastern Washington where it has been growing rapidly and complements the heavy summer irrigation load.

But PUD spokesmen declared there was little to fear. The arrival of natural gas, it was pointed out, could mean more business for electric utilities.

Reassurance for PUDs

Gaw also tried to reassure the electrical men that the heating load would be big enough for everybody in view of the area's population growth. But he declared that the gas companies will aim for an "all-gas rate" which will be "very, very competitive with present all-electric rates." To compete in the industrial market with fuel oil selling at $2.10 a barrel, gas will have to sell at 35¢, Gaw stated.

Earlier, Milt Bona of Vancouver, public relations counsel for some of the PUDs, described the favorable reception which PUDs had received in selling electric heat. Natural gas, he admitted, would offer more competition. But, he added, electric heat could win an increasing share of the market wherever electricity is available.

Ken Billington, executive secretary of the Washington PUD Association, pointed out that the coming of natural gas to the Northwest would mean additional business for the electric utilities.

"The reason," he said, "is this: One of the biggest increases in the use of natural gas will be for industrial purposes. New industries also will be new electric customers and new industries will bring additional population—also electric customers."

"Experts," he continued, "do not see natural gas making great inroads into the electric utility business . . . (The cost of) most electric water heating is, on the average, not more than 20% higher. People . . . are too sold on the cleanliness, safety, and convenience of electricity to switch to gas unless the price spread is a lot more than it appears it will be."

Portland GE Cops Top Parade Award

Hawaiian orchids and pastel daisies, parading as a Roman fountain, copped the top commercial-category award for Portland General Electric Co in the recent Portland Rose Festival parade. Titled "Coins in the Fountain," the PGE float carried out the parade theme of "Famous Books in Flowers." To represent the fountain's spray, 6,000 butterfly orchids were flown from Hawaii. Pastel daisies formed the fountain's base. Basic design of the float approximated that of an actual fountain in Rome.

Pushes NW Gas Supply

A nine-member joint venture partnership to help bring natural gas to the Pacific Northwest has been organized in Seattle by a group of engineering firms and independent associates. The organization will be known as Gellert, Griffin, Carey, & Associates. H. Henry Gellert, former president of the Seattle Gas Co and a leader in the move to bring natural gas to the region, will be executive partner in the firm. Planning of gas distribution is expected to be a part of the firm's work.

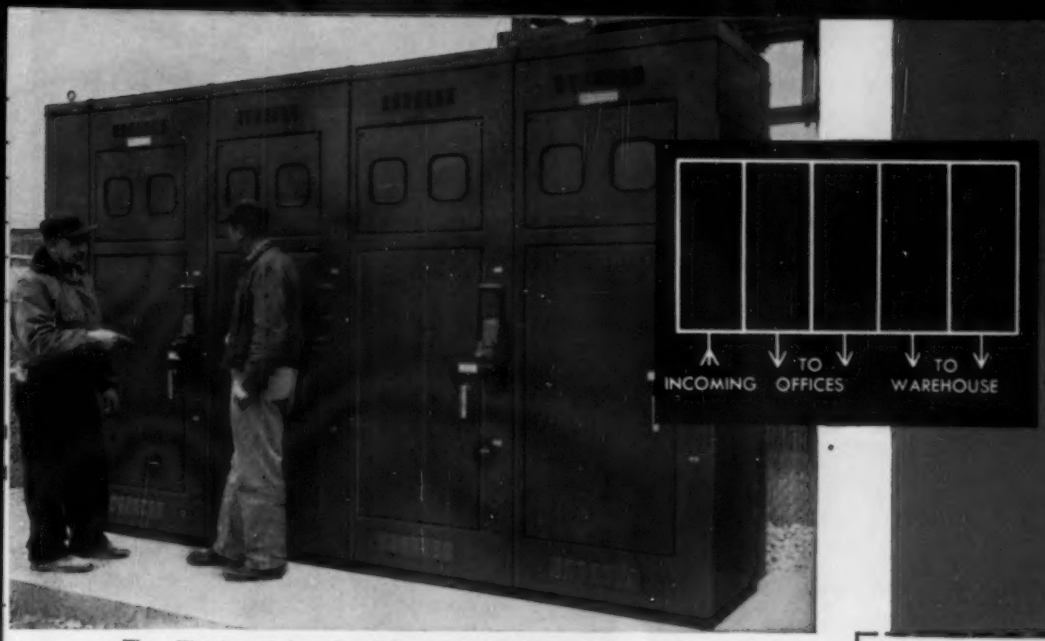
Cables Across Straits Give Sicily More Power

Ship traffic through the Straits of Messina recently halted for ten days while six electric cables were suspended across the 2.3 mi from Italy to Sicily.

The high-flying cables will supply expanding Sicilian industries with an additional million kw of electricity per day from the Italian mainland where a hydro station is fed by an artificial lake near the small town of Calabria.

Two towers, each 786 ft high, have been erected—one on the Calabrian side and one on the Sicilian side of the Straits. The towers are among the highest in Europe and the cables, strung 220 ft above sea level, constitute the longest suspension of the kind in the world.

Both the towers and cables will be lighted at night by 1,000 electric lamps as a safety precaution. And special foundations have been installed for the towers to resist the frequent earthquake shocks in the area. The volcanic nature of the soil also presented unusual engineering problems in laying the tower foundations.



Wm. Wetzig (right), Jewel Tea Co. engineer, confers with John Corsiglia of Hyre Electric Co., installation contractor.

CUT THE COST OF YOUR HIGH-VOLTAGE SUPPLY SYSTEM BY SPECIFYING S&C METALCLAD SWITCHGEAR . . . IT DOES THE JOB FOR HALF THE MONEY

Get off to a good start on the plans for your electrical system by selecting S&C Metalclad Switchgear. That is what A. Epstein & Sons did for Jewel Tea Company's new office-warehouse building. The savings made at the switching center were considerable, and they were reflected in a lower cost high-voltage supply system.

S&C Metalclad Switchgear provides all the necessary protection and switching for high-voltage feeders—at about half the cost of other types of metalclad switchgear. A simplicity of design assures complete dependability with far less maintenance.

Electrical engineers and contractors alike find the experienced recommendations of S&C field engineers extremely valuable in reducing electrical construction costs. Write or phone your nearest S&C field office . . . they will be glad to assist you.

MR. SOL KRIVO

Chief Electrical Engineer for A. Epstein & Sons—Chicago architect-engineers—planned the high-voltage supply system for the newest Jewel Tea Company building. He says, "Since S&C were the originators of this type of outdoor metalclad switchgear, we are sure they have the 'know-how' to furnish equipment best fitted to our jobs. Our customers have been completely satisfied by the simplicity, low cost, and easy maintenance of S&C Metalclad Switchgear."

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Mechanization Halves Cost of Clearing R-O-W

Louisiana P&L uses two specially designed machines for cutting timber, a standard mowing machine for maintaining rights-of-way, and rake mounted on tractor to pile debris

Battleship with 16-ft cutting edge

Whirling Jesse with rotating blade

E. L. LANCASTER, Engineer, Louisiana Power & Light Co, New Orleans, La.

Mechanization has reduced the cost of clearing rights-of-way of Louisiana Power & Light Co 50%. Most of these savings have been made practicable by use of three cutting machines:

1. A cutting blade that looks like a battleship prow and attaches to a tractor was developed for clearing first-growth timber.

2. A specially designed rotary saw and engine were added to another tractor for cutting second growth.

3. A mowing machine attached to a small tractor maintains the rights-of-way once they have been cleared.

Use of this equipment has eliminated hand clearing except where the ground is soft and heavy equipment cannot operate. A better appearing and more easily maintained right-of-way is obtained. Moreover, very little soil is disturbed, thereby, minimizing erosion.

Mechanizing the operation resulted from efforts to obtain clearing methods agreeable to both the property owner and the company at reasonable costs. Property owners in this timber growing area are reluctant to grant a right-of-way that would deny the future growth of timber. The company is interested in reducing a major construction cost.

Initial Cutters Unsatisfactory . . . A tractor with a conventional bulldozer blade was initially tried for clearing. But the end results were unsatisfactory. The grubby right-of-way resulted in a costly operation to get rid of stumps and debris. In addition, disturbing the earth's top soil promoted erosion that could be remedied only by another costly operation of building terraces and seeding the area.

Therefore, a wide, flat, cutting edge was attached to the base of the bulldozer blade. And a pusher bar was added to the top of the blade with its leading edge in front of the cutting edge. When rammed against a tree, the sharp edge cuts in while the bar pushes against the tree.

This combination was an improvement over the conventional bulldozer blade. Soil was left relatively undisturbed and stumps were left in the ground. The equipment, however, had limitations:

1. The size of tree the machine could handle was limited to approximately 12 in. dia.

2. After severing about two-thirds of the tree the blade would ride up and leave a large sliver attached to the stump.

Battleship . . . The blade now being used on a tractor is called the "Battleship," whose prow it resembles. It has a single cutting edge 16 ft long made from 1¼ x 24-in. steel plate along one side of the prow.

The teeth, burned out of the blade with a torch, have a sine-wave appearance along the cutting edge. Teeth initially shaped like conventional saw teeth assume this sine-wave shape with wear. Sharpening the cutting edge is done with an electric hand sanding disc fitted with carborundum paper.

A 6,000-lb blade to fit a HD-15 or D-7 tractor can be made in a welding shop for $2,175. It requires 115 welder hours, 25 helper hours, and 25 foreman hours.

. . . pushes over partially cut tree

. . . after which rake piles debris

. . . cuts trees at ground level

. . . so mower can maintain R-O-W

Smallest tractor for handling this blade is a HD-15 or equivalent. The TD-24 with separate speeds for each track has proved best but is not economical for small jobs.

In use, the Battleship penetrates 18 in. into a tree. If necessary, the tree can be cut to this depth around its entire circumference. Then the blade can be hoisted and the point pushed into the tree at a height of 10 ft. This gives the tractor leverage to push over the tree.

When the tree breaks, some of the core pulls out of the stump below ground level leaving the top of the stump level with the ground. This is very important during initial clearing because the right-of-way is maintained by mowing.

The Battleship is limited in use to firm ground that will enable the tractor to develop sufficient traction. Its use is rather costly on rights-of-way having small scattered woody areas where equipment must be moved frequently by truck and trailer.

After the timber has been felled with the Battleship, a rake mounted on a tractor pushes the brush and trees, except saleable timber, into piles for burning. Cost of clearing and burning ranges from $65 to $100 per acre.

Whirling Jesse . . . Another cutting machine, known as the "Whirling Jesse," has been developed to cut the costs of clearing second-growth from existing rights-of-way to ready them for mowing. A local manufacturer built the machine for $8,500 and rents it for about $10 per hr.

Whirling Jesse has a circular blade made of $\frac{3}{8}$-in. steel plate. The circumference of the plate is cut to form 18 teeth, which are built up and hardened. A six-cylinder engine powers the blade through a fluid drive at a peripheral speed of 12,000 fpm. The tractor is a TD-6 or equivalent.

Two means are provided to prevent the blade from cutting into the ground. On relatively even ground a front dolly wheel is used. However, on uneven ground it is necessary to raise and lower the blade. This is accomplished by means of a winch line attached to the frame of the blade.

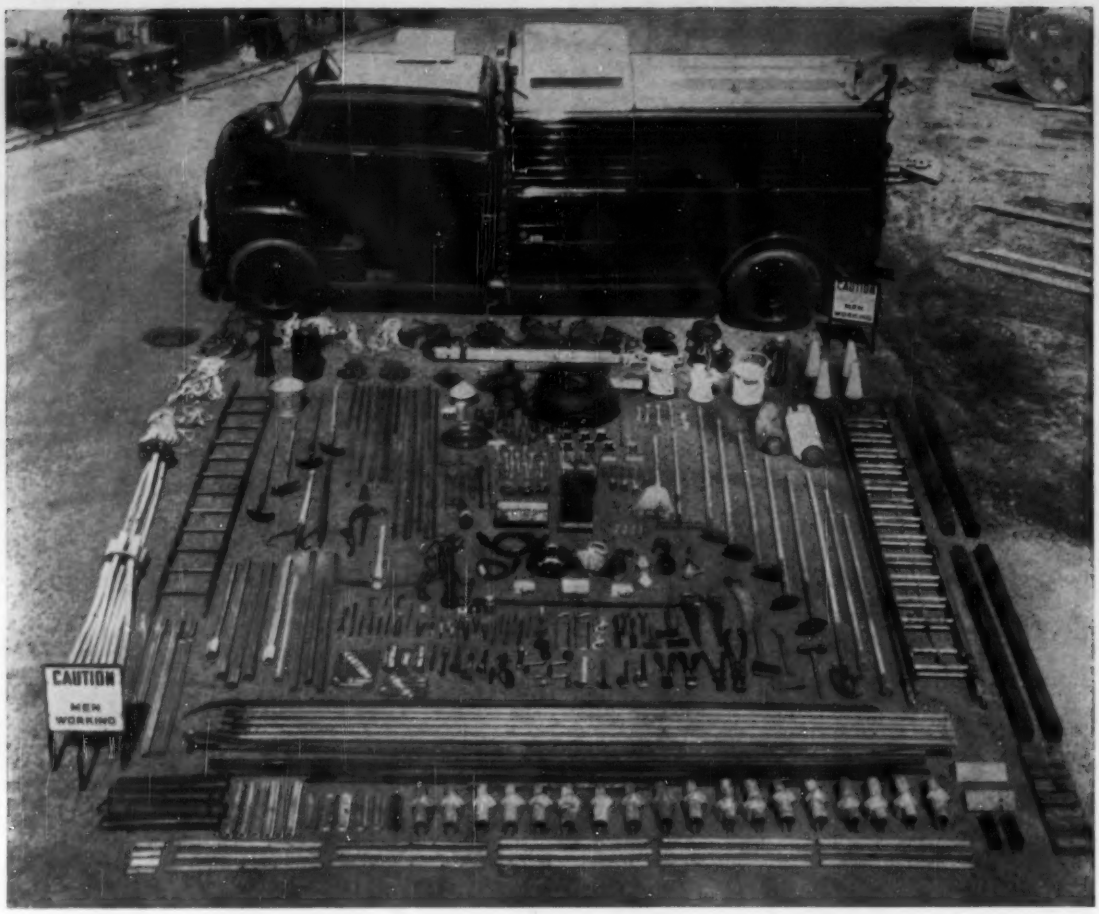
Like the Battleship, the Whirling Jesse can be employed wherever a tractor will operate. In swamps the machine has no application.

Performance of the Whirling Jesse has been very satisfactory. It pulverizes dead timbers and brush and easily cuts hardwood trees up to 4 in. dia. With more than one pass it cuts larger trees. When an immovable object is hit, the fluid drive cushions the shock, slowing the blade to prevent damage.

In an 8-hr day the machine clears up to one mile of 100-ft right-of-way. Results are far better than can be obtained by hand-clearing.

Mowing Machine . . . To maintain rights-of-way that have been cleared of first or second growth timber, a small farm tractor with attached mowing blade is used. Louisiana P&L has found that at $20 an acre this is the cheapest means available.

To employ the mowing machines successfully stumps and other objects injurious to the moving blade must first be removed from the right-of-way. The Battleship and Whirling Jesse accomplish this without adding to the initial clearing cost.



Look at your line truck equipment needs from this angle . . .

Here's a poles-eye view of a typical utility line truck showing the wide variety of construction and maintenance tools and safety equipment your linesmen need for most day-to-day jobs. But—without exception—each and every item shown can be ordered conveniently from your nearby Graybar office or warehouse . . . and in every case you get the type and quality needed to assure speed and efficiency on the job *plus* long years of satisfactory service. All are products your linesmen know and respect—products that have been tried, tested and proven in the field by scores of companies just like your own.

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Graybar is thoroughly familiar with utility requirements. Further, your nearby Graybar Representative stands ready to help as a convenient source of information on everything needed for pole-line construction and maintenance. And should you be faced with an out-of-the-ordinary problem, call on the experience of a Graybar Outside Construction Specialist for a consultation. We'll welcome your inquiry!

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IN OVER 120 PRINCIPAL CITIES

Utility Training Programs Surveyed

A total of 5,593 apprentices and 3,274 other workers are in training in 502 of the nation's privately-owned and publicly-owned electric power firms, a survey released by the U. S. Department of Labor's Bureau of Apprenticeship shows.

The 502 firms (See Table I) are among 902 visited by the Bureau's field representatives to determine what is being done to meet the skilled worker needs of the electrical power industry. Of the 502 firms, 360 have established apprenticeship training programs.

Training directors are employed by 85% of the firms that have 5,000 or more workers, and by 42% of the firms that reported between 1,000 and 5,000 workers, the survey shows. Responsibility for the administration of training programs in relatively small companies is usually assigned to a superintendent or manager, although in some instances personnel managers and foremen have charge of the training.

Table I—Number of Electric Power Companies Engaged in Certain Training Activities (By Size of Plant)

Size of Company (total employment)	Total Number of Companies Reporting	Number Conducting Training	Number Training Apprentices	Number Having Registered Apprenticeship Programs	Number Conducting Other Types of Training
Less than 10	308	82	57	9	34
10–29	261	156	113	17	78
30–99	142	109	71	15	71
100–999	107	95	76	9	64
1,000–4,999	54	48	36	10	36
5,000 & over	12	12	7	1	11
Total	884	502	360	61	294

Skilled Worker Needs High

The survey shows that training activity in the industry is fairly extensive, especially in the larger power plants. However, the industry as a whole still has a big job to do to meet its skilled worker needs, the Bureau pointed out. Most of the apprentices, the survey shows, are training for work as linemen. There were 3,138 apprentices in this trade alone. Others are training for jobs as powerhouse and meterman electricians, cable splicers, and allied occupations (See Table II).

The need in the industry for additional skilled workers, particularly linemen, is reflected by the large proportion of apprentices to journeymen employed by many companies, the Bureau said. The average ratio, the study points out, is one apprentice to about every four journeymen linemen employed.

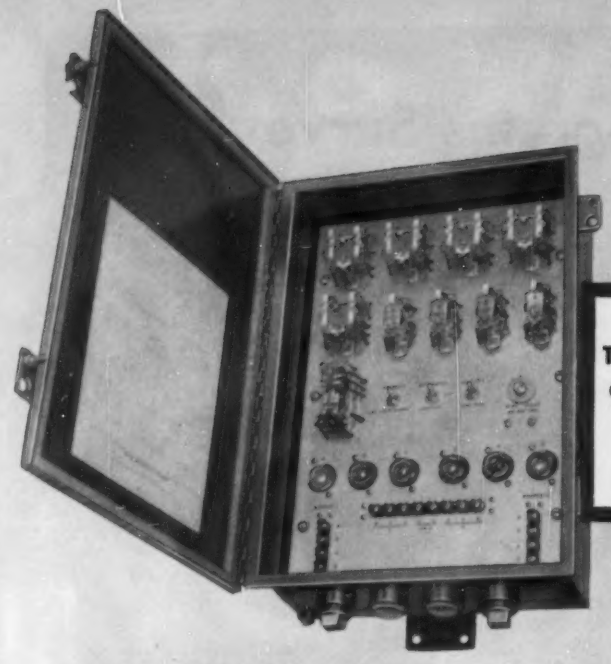
Among small companies conducting apprenticeship programs, a more liberal ratio was reported than that which prevailed in larger companies. There was an apprentice lineman for every 2.8 journeymen in companies employing fewer than 30 workers. On the other hand, large firms reporting at least 1,000 employees had one apprentice lineman for every 4.3 journeymen.

Although small companies frequently reported a liberal ratio of apprentices to journeymen, their percentage of trainees was not very large.

Copies of the study, titled "Training Activities of Electric Power Companies," may be obtained by writing to the Bureau of Apprenticeship, U. S. Department of Labor, Washington 25, D. C.

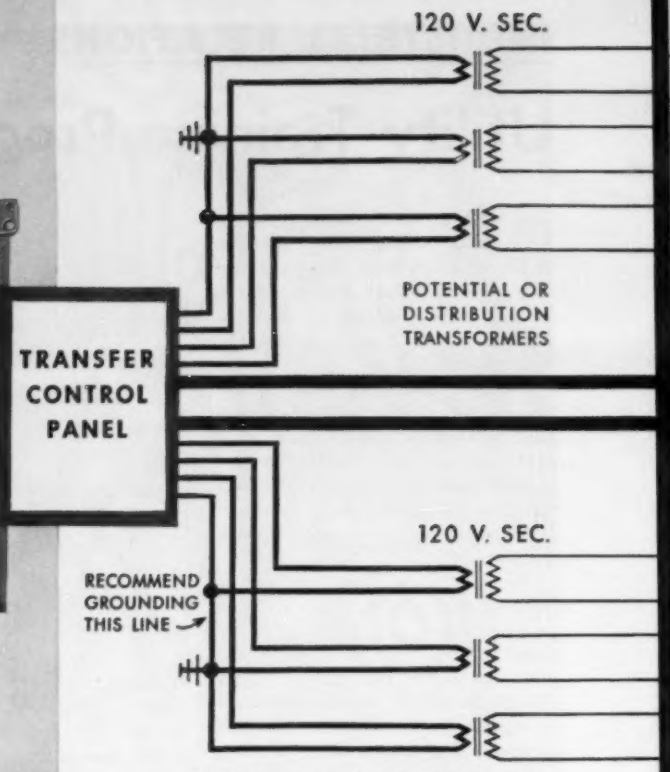
Table II—Number of Employees in Certain Types of Training Programs (By Size of Plant)

Size of Company (total employment)	Number of Trainees: Grand Total	Apprentices: Total	Lineman	Meterman electrician	Powerhouse electrician	Cable splicer	Other	Total	Other Trainees: Lineman	Meterman electrician	Other
Less than 10	38	25	21	2	—	—	2	13	9	1	3
10–29	248	120	100	5	—	2	13	128	36	5	87
30–99	368	251	178	11	8	2	52	117	44	2	71
100–999	2,248	1,839	807	177	145	44	666	409	88	36	285
1,000–4,999	5,015	2,411	1,619	210	144	41	397	2,604	1,015	250	1,339
5,000 & over	950	947	413	8	53	119	354	3	—	3	—
Total	8,867	5,593	3,138	413	350	208	1,484	3,274	1,192	297	1,785



TYPE S TRANSFER CONTROL

L-M's Type S automatic load transfer control is completely enclosed in weatherproof steel cabinet. It is designed to operate with L-M's single-phase Type NR switch, heavy-duty Type R three-phase recloser, or L-M's new three-phase heavy-duty Type VR switch.



NOTE: Control may also be furnished for single-phase sensing, is recommended if three-phase protection is provided in each feeder.

NOTE: For simplicity, protective equipment (fuses, lightning arresters, etc.) are not shown.

Automatic Load Transfer Control For 4-Wire Wye System—Three-Phase Sensing

The diagram above shows a typical load transfer scheme. Below is the operating sequence using L-M's new Type VR switch and Type S transfer control panel. This provides an economical and dependable method of assuring service continuity.

Operation of the Three-Phase Sensitive Control

1. Assume load is connected to Source I and potential on either phase A, B, or C is lost. If either X, Y or Z is not energized, no switching occurs. If X, Y & Z become or are all energized, VR on I opens and VR on II closes, after time delay, thus transferring load to other feeder.

2. Assume control is set for "Source I preferred," load is connected to II, and X, Y & Z are energized. If energy returns to A, B & C, VR on II opens and VR on I closes, after time delay.

Assume control is set for "no preference," load is connected to II, and X, Y & Z are energized. If A, B & C are energized, nothing happens. If X, Y or Z then loses potential, after time delay VR on II opens and VR on I closes.

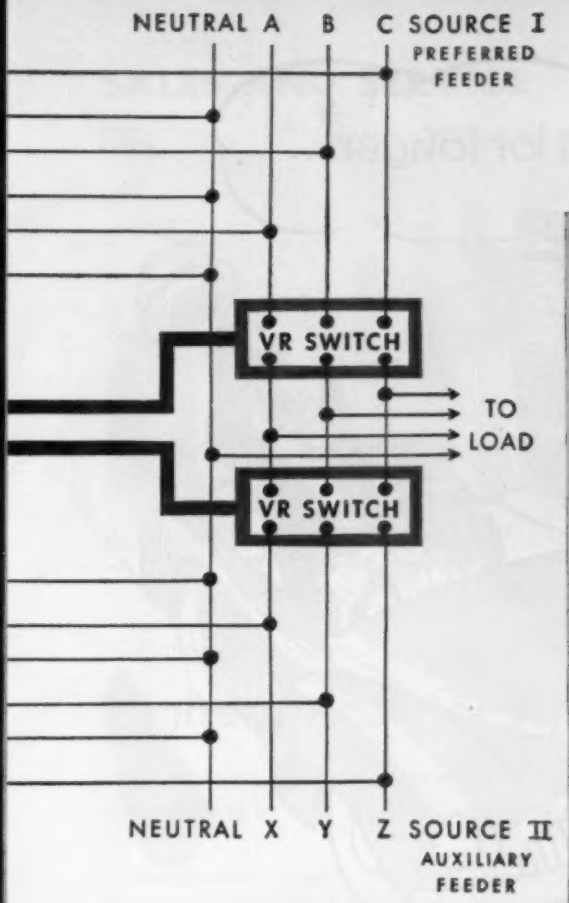
3. Control is sensitive to three-phase energy. It seeks to disconnect single- or two-phase service but will remain on the same source if the other source is not three-phase.

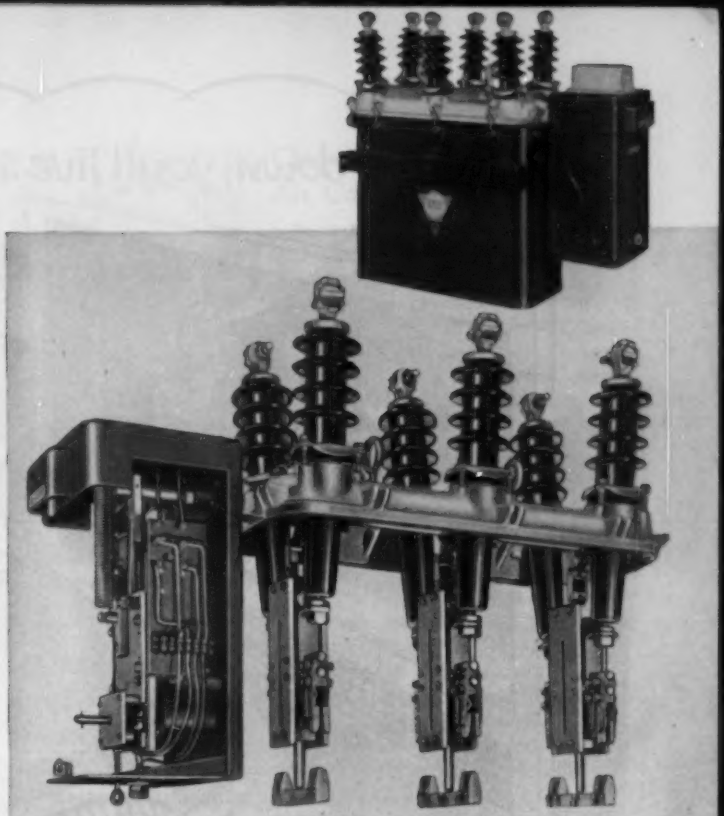
4. Electrical interlock insures that VR I is open before the other switch begins to close. This applies to both automatic and manual motoring operations.

5. Manual switches provided inside cabinet to transfer load to either source. Another switch selects "Source I preferred" or "no preference."

6. Time delay adjustable up to approximately one minute; longer delay (up to 5 min.) available on special order. Same delay, either direction of transfer. Delay should be set to prevent false operation on transient conditions.

LINE MATERIAL





VR SWITCH L-M's new heavy-duty Type VR switch is rated at 14.4 kv RMS, with a 110 kv BIL, a 20,000 ampere momentary rating and a 400 amp thermal rating. Simultaneous clearing of all phases in 3 cycles. Solenoid operates on 120 volt secondary, requires 1.5 amps to trip.

Automatic Switching...

L-M's New Load Transfer Equipment Assures Service Continuity To Important Loads

By **FRANK McSTAY**
Product Manager
Kyle Products
Line Material Company

Distribution systems are being called upon to be even more reliable in supplying power to important loads. Hospitals, radio and television stations, government and many industrial loads must have better service continuity.

L-M's new Type S automatic load transfer control and Type VR heavy-duty oil switch provide an excellent means for automatically switching important loads during feeder outages.

Automatic Load Transfer Control

The Type S control is a pre-assembled, pre-wired relay device which is completely enclosed in a weatherproof steel cabinet. It is quick and easy to install.

Adjustable time-delay relays are used in L-M's Type S controls to prevent false operation on transient conditions. An interlock mechanism in the control circuit permits load transfer to the auxiliary feeder only after the switch has disconnected the faulted feeder. The interlock is also arranged so that the Type S will transfer the load only when the auxiliary or standby feeder is energized.

The Type S control is extremely versatile. It will operate with L-M's single-phase 200 ampere Type NR switch, with the heavy-duty Type R three-phase recloser, or with L-M's new three-phase, heavy-duty Type VR switch. The type S can also be applied to automatic reclosing circuit breakers which have been slightly modified.

Heavy-Duty, Three-Phase Oil Switch

L-M's new remote control Type VR oil switch is a 14.4 kv 400 ampere heavy-duty switch, designed for capacitor switching, distribution feeder sectionalizing, and automatic load transfer applications. The Type VR has a 110 kv BIL with a 20,000 ampere momentary rating. The unit trips and clears all three phases simultaneously in three cycles.

An auxiliary switch is available with the VR or can be added in the field. It may be a one, two, three, or four stage unit, used for remote-position indicating or low-voltage-control switching of apparatus used in conjunction with the VR switch.

Get bulletins and complete information on new load transfer schemes and equipment from your L-M Field Engineer, or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

225

Kyle® Switchgear

a slow speed meter will live longer too!

Whatever you're doing, wherever you are, you'll live longer if you slow down. Slow speed equipment will live longer too . . . because there's less wear, less friction. Thats why the slow speed Sangamo J2 Watthour Meter lasts longer than other meters . . . *because the disk speed of the J2 is a full 40% slower* than the disk speed of any other watthour meter on the market.

The J2 meter with its 6. constant needs less compensation for accuracy from the lightest loads to its full capacity of 100 amperes. And the remarkably good and *uniform* load characteristics of this slow speed design have been proved on utility companies' lines throughout the country.

JM55-6

***DO YOUR PART—"SLOW DOWN AND LIVE"** The nation-wide "Slow Down and Live" traffic safety campaign, sponsored by the National Conference of State Safety Coordinators, is underway and will continue through Labor Day. Started in 1953 by a group of northeastern states, this campaign was so successful, it was extended to 24 states last year. The result: 601 lives saved. The National Safety Council estimates the 1955 campaign among all states will save 1100 lives if as successful as the 24-state campaign last year. So do your part—"Slow Down and Live."

THE J2 METER IS THE SLOW SPEED METER

SANGAMO
ELECTRIC COMPANY
SPRINGFIELD, ILLINOIS

Hotpoint's McDaniel, Motorola's Taylor, Revere's McCreery
"Business Is Up, And Prices Are Headed That Way"

SALES—Residential

Higher Prices for Appliances?

Rising labor, material costs will force up price tags, but sales will continue at high level, Merchandise Mart show told

Appliances and radio-TV are going to have higher price tags in the months ahead.

This seems to be the feeling among manufacturers who displayed their wares late last month at Chicago Merchandise Mart's midsummer appliance show.

Higher labor and material costs will be responsible for the price boosts, but there was no certainty that higher retail prices would affect sales. In a panel discussion during the show's special press conference, C. M. McCreery, vice president of Revere Copper and Brass, Inc pointed out that increased labor costs must necessarily be reflected in prices. Some felt that since most appliances are bought on the installment plan, a small price boost spread over many payments would go almost unnoticed.

Another panelist, John F. McDaniel, vice president of Hotpoint Co, said though prices will go up, the sales outlook is bright. Appliance sales for 1955, he said, are estimated at 12 million units, and this will increase by 75% in the next 10 years. Factory shipments for the first five months of '55 are up 30% compared to the same period in 1954, he pointed out. Distributor sales are up 23% and retail sales are up 14%.

McDaniel noted, however, that the number of electrical dealers is steadily decreasing. At the peak in 1950 there were 86,000 in the nation. Today the number is estimated at 67,000.

Edward R. Taylor, vice president, Motorola, Inc, the third panel member, told the conference that the radio and television industry also faces a rosy future. Estimated 1955 sales, he said, is 7½ million television sets and 12 million radios.

As is usually the case at summer showings, few real changes were evident in the models exhibited. Principal items:

- Still more color in appliances. The inventory problems posed by color are recognized, but the feeling is that color would accelerate obsolescence of old appliances and step up sales volume;
- More built-ins. Some manufacturers without previous models of any kind were showing them. Others had added refrigerators, and were talking of other built-in possibilities;
- More refrigerators with freezer space at the bottom, reflecting growing demand for combination units.

Cleaning Time Is Cut in Air Conditioned "Village"

Madame Housewife can save up to 22 hours per month in cleaning time —if her home is air conditioned.

This is the conclusion of a long-term study made of a 22-home air conditioned "village" near Austin, Texas. The study, reported at the recent semi-annual meeting of the American Society of Refrigerating Engineers, also came up with these findings:

- Evening meals in air-conditioned homes were found to have 40% more calories than those in similar non air-conditioned homes;
- Heat rash in infants was completely eliminated, and colds and other nasal problems were reduced;
- Operating costs for full-house air conditioning, even in an area as warm as Austin, were less than $100 a year for half the 22 families in the study.

The test homes, built by the National Association of Home Builders, are equipped with central system air conditioning. Families were found to prefer keeping temperatures at 75 to 78 F with even humidity between 40 and 60%. Some families requested a lower temperature, but seemed happy with 75 F, unless they knew it was 75 F. All families complained of discomfort when researchers conducting the tests exposed them to rapid changes in humidity.

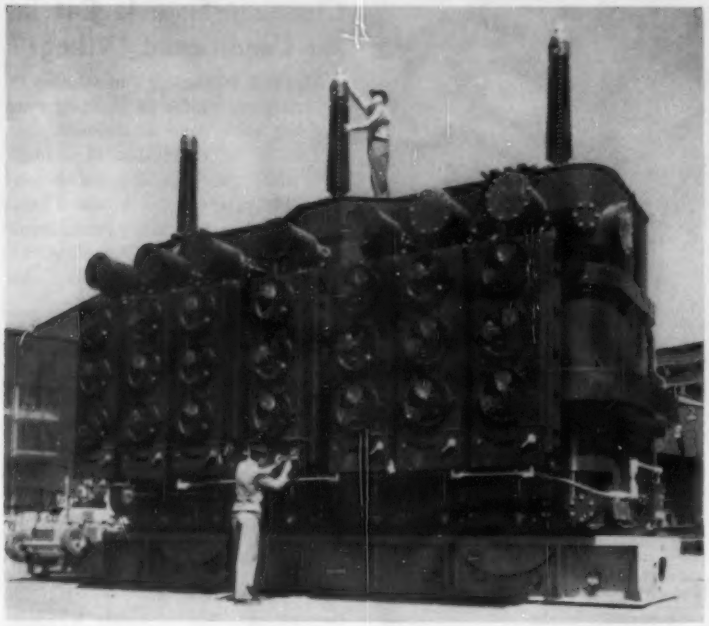
S & S NOTES

Peoples' Choice

Nine out of ten homeowners are prospects for some type of electric heating, Stanley B. Aronson, national sales manager of Berko Electric Manufacturing Co recently told a group of Indianapolis, Ind. electrical contractors. Aronson addressed the contractors at their "graduation" from space heating course sponsored by Electrical League of Indianapolis.

Chambers Goes Electric

Heavy population shifts to suburban areas has prompted Chambers Ranges Inc, manufacturers of gas cooking equipment, to enter the electric cooking field. Chambers said the move would open new markets in suburbs not presently served by gas mains.



GE Ships Giant Transformers

Largest power transformers ever shipped by the General Electric Co from its Pittsfield works, were two identical 300 Mva (nominal rating), 22.5-161-kv, 3-phase units. Both transformers will be installed at the new Gallatin steam-electric generating station on the Tennessee Valley Authority's system. Addition of cooling units will boost the capacity to 315 Mva.

One transformer is illustrated. Completely assembled and filled with oil, each transformer weighs 255 ton. Despite their huge capacity, each unit was shipped upright on one flatcar. They were stripped only of bushings, unit coolers and accessories, and with the insulating oil replaced by gas. Shipping weight is 190 ton each. The transformers are 27 ft long, 19 ft wide, and 16 ft high. The 161-kv bushings add another 8 ft to the installed height.

Design and drafting took about 18 months, and manufacturing about 8 months. GE reports that three electromagnetic models were built and tested to determine the most efficient final design for the transformer.

B&W to Build World's Largest Boiler

Babcock & Wilcox Co has signed a contract to design and build what is said to be the world's largest boiler for the Consolidated Edison Co of New York. The unit, which will be installed at Con Ed's Astoria, Queens station, will have a steam capacity of 2.4 million lb per hr. It will produce enough steam to generate between 300,000 and 375,000 kw.

Design pressure of the boiler will be 2,500 psi. The unit will be of the twin furnace type in which the steam is brought up to maximum temperature of 1,050 deg in one furnace, then goes through the turbine where some of the energy is extracted, and returns to the other furnace for reheating to 1,000 deg. The boiler will burn either coal, oil or natural gas, or a combination of these fuels.

The largest part of the boiler, the steel drum, will be built at B&W's plant in Barberton, Ohio. It will be 101 ft long and will weigh 235 ton. Erection of the boiler will start early in 1957. It is scheduled to begin operations in the fall of 1958.

Bethlehem Bids Low For Towers on 345-Kv Line

Bethlehem Pacific Coast Steel Corp, San Francisco, is the apparent low bidder for another lot of tower steel for construction of Bonneville Power Administration's 345 kv transmission system linking Chief Joseph Dam and the Puget Sound load centers.

Bethlehem's offer of $590,502, fob shipping point, was low among six offers announced May 27. American Bridge of U. S. Steel, fob Pittsburgh at $565,389, was next lowest domestic bidder after computing of shipping costs amounting to about $13,000 on Bethlehem's bid and about $90,000 on American Bridge. Lowest of four fob destination offers was Societa Anonima Elettrificazione, Via Larga 8, Milan, Italy, at $544,492. This was subject to 25% added for foreign bids. Remaining three offers, all domestic fob destination, ranged above $600,000.

The steel is for erection of towers on Covington No. 1 single circuit transmission Sultan-Covington section.

Earlier the same week, Bethlehem was awarded $516,966 contract for delivery of similar tower steel for Chief Joseph-Snohomish No. 4 line and powerhouse lines 1 through 4. Delivery limit is 375 days.

The lines involved are scheduled to be energized in 1956 and 1957.

Mica Fabricators Look for Reduced Import Duty

Mica Fabricators Association, New York, at its Eleventh Annual Meeting, reported progress on efforts to have the import duty reduced on uncut mica block, films and splittings.

At the Association's request, Rep Frank M. Karsten (D-Mo.) has introduced a bill known as HR-6299. This bill would reduce the duty on unmanufactured block mica to 4 cents per pound regardless of value. And, it would put on the free list uncut mica, condenser films and splittings, regardless of thickness.

At the same meeting officers elected were: S. A. Montague, proprietor of Spruce Pine (N. C.) Mica Co., was re-elected president for a second one-year term; Peter J. Yannello of Reliance

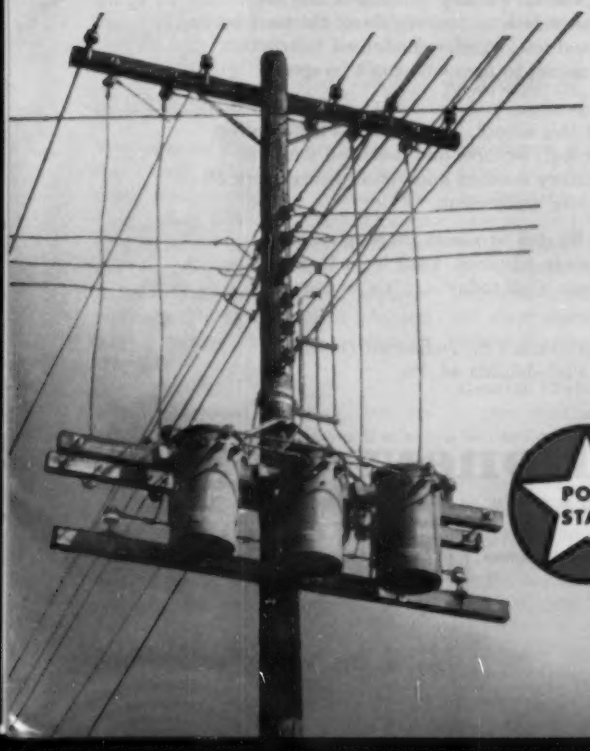
(*Continued on page* 59)

you don't have to tip that crate ...it's a "Pole Star"

As a matter of fact, the truck operator doesn't even *need* a helper to handle Pennsylvania Pole Star transformers from 3 through 100 Kva, 15 Kv and below. That's because they're all furnished with wrap-around, wire-bound crates equipped with *bottom skids* . . . a practice long followed by Pennsylvania Transformer Company for units 37½ through 100 Kva and now extended to all smaller Kva sizes.

This newest Pole Star "extra" means easier handling at every stage: when unloading incoming trucks . . . when arranging stocks in the warehouse or pole yard . . . when loading for transportation to the field. The crates are designed for handling by one man with a standard warehouse-type fork lift truck. Transformers may be stacked vertically, too, for conservation of space.

Customer advantages like the new Pole Star crate illustrate Pennsylvania Transformer Company's never-ending concern with *all details* of transformer use . . . from ease-of-handling to efficiency-of-operation. We invite you to write, wire or 'phone for more details.



POLE STAR

pt

Distribution Sales Department

Pennsylvania Transformer Company

A McGraw Electric Company Division

CANONSBURG · PENNSYLVANIA

Pole Star transformers are available in sizes 3 Kva through 500 Kva and in voltages from 480 through 67,000 volts.

Practical service training at Honeywell's school...

makes your instrument men more valuable

YOUR instrument maintenance men can get a real education in the most up-to-date methods for servicing instruments, at Honeywell's Training School. Any organization which uses Honeywell instruments can send maintenance personnel to this school. Tuition costs you nothing, for this school is maintained as a "plus-value" service to Honeywell customers.

Thousands of technicians have either started or augmented their instrument knowledge here. A variety of courses is available, to fit men for the particular kind of maintenance problems they may encounter in their specific jobs: The comprehensive course . . . one of the most complete and intensive offered anywhere . . . covers about thirteen weeks. Other courses cover five weeks and less, to offer condensed instruction of either a basic or "refresher" nature to men who can't be spared for extended periods.

There's nothing academic about this school. The emphasis is placed on practical knowledge. Theory through lectures and textbook study is liberally supplemented by laboratory sessions and actual bench work on all types of instruments and related equipment.

One caution: classes have to be limited to assure thorough attention to all students, so make reservations in advance. Your local Honeywell office will be glad to make arrangements. Call today . . . it's as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, Wayne and Windrim Avenues, Philadelphia 44, Pa.

MINNEAPOLIS
Honeywell
BROWN INSTRUMENTS

H HONEYWELL

First in Controls

Mica Fabricators

(*Continued from page* 59)

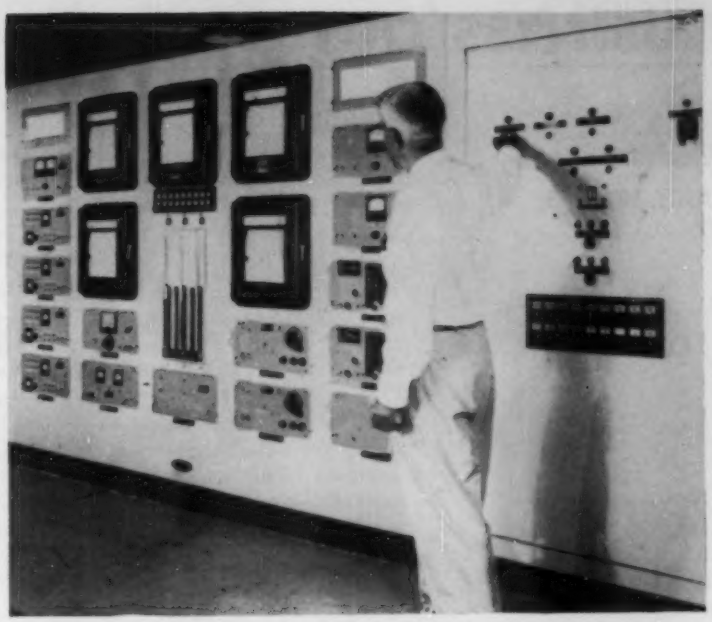
Mica Co, Inc, Brooklyn, N. Y., and John V. Faraci of American Mica Insulation Co, Manasquan, N. J., were elected vice presidents for the coming year. Stewart N. Clarkson is executive vice president, located at 420 Lexington Ave., New York 17, N. Y.

Penn Transformer Host to Korean Engineers

Pennsylvania Transformer Co of Canonsburg, Pa., was recently visited by two South Korean electric power company engineers. They viewed design drawings of a 32,000-kva, 154-kv transformer destined for Korea, and were conducted on a tour of the Canonsburg plant.

The visitors were Won Suk Sung, assistant manager of the Pusan branch of Korean Electric Co, and Chae Suk Lee, assistant superintendent of construction for the same company. Both are members of an electric power survey group sponsored by the Foreign Operations Administration. They are studying utility operations and equipment in preparation for training of other South Korean engineers.

The transformer mentioned above is being manufactured for Bechtel Corp. It is part of an FOA contract under which the California firm is building power plants for Korean Electric Co.



L&N Equipment Controls Geneva Reactor

The operating level control channel and recording instruments designed by Leeds & Northrup Co for the Geneva atomic reactor, were tested on July 4. The "swimming pool" type reactor will be a major United States exhibit feature at the International Conference on the Peaceful Uses of Atomic Energy which will be held in Geneva, Switzerland, from August 8 to 20. The entire U. S. exhibit was designed and built, and will be operated in Geneva, by Oak Ridge National Laboratory of the U. S. Atomic Energy Commission.

L&N recording instruments guide the crew in bringing the reactor up to the operating power level. At that point, other L&N equipment takes over automatic operation of the unit.

Illustration above shows E. P. Epler, Oak Ridge National Laboratory engineer at the control panel operating the reactor in the recent test which was conducted at maximum power for 25 min.

MANUFACTURING BRIEFS

Westinghouse Electric Corp announces that a large 400 rpm, 5,000 kw waterwheel generator built in its Sunnyvale, Calif., plant, has been installed in the City of Centralia's power station on the Nisqually River, Wash. The unit is the last of three major equipment pieces bought by the city to complete a $1.5 million expansion project on the river.

North American Aviation, Inc recently established a separate Nuclear Engineering & Manufacturing Division. Dr. Chauncey Starr was elected vice president in charge of the division which will design, develop and service nuclear reactors for generation of electric power, and medical, industrial and scientific research.

Remington Rand Inc has two new UNIVAC-Scientific models which can be used directly with the company's commercial UNIVAC and File-Computer. Use of metal magnetic tape in the scientific models instead of plastic tape allows data and results from each of these machines to be fed to the others interchangeably.

General Electric Co recently opened a new multi-million dollar plant in Waynesboro, Va., for the manufacture of electronic controls used in "automated" processes. The plant, which contains 190,000 sq-ft of manufacturing and office space along with a product development laboratory, will be the headquarters of GE's Speciality Control Dept.

Minneapolis-Honeywell Regulator Co, Heiland Division, is building a $1 million plant in Denver, Colo. Heiland manufactures scientific instruments and photographic supplies. The 45,000 sq-ft plant will house general sales offices and manufacturing facilities. Occupancy is expected early this fall.

ASTM (American Society for Testing Materials) has created a new committee, designated F-1, on Materials for Electron Tubes and Semiconductor Devices. This committee will be concerned with all classes of materials for the indicated specific uses or functions. Emphasis will be on research leading to increased knowledge of materials as a basis for sound specifications and methods of test.

BUSINESS OUTLOOK

Electrical World
JULY 18, 1955

The outlook, in brief: Fine! The one big cloud—a possible steel strike—has blown over. Industrial production is still at record levels. Consumer incomes are highest ever. And construction activity is hitting a new all-time high this year.

The boomingest part of the boom is in new home building. The annual rate of housing starts was 1.4 million during the first quarter. It's now running about 1.3 million and will probably drop slightly more before the year is over. But 1955 will still top all previous years except 1950.

Can the construction boom last into 1956? Some cautious observers doubt it. They cite the high level of mortgage indebtedness and a slight increase in rental vacancies as danger signs. But several key factors are on the side of the optimists:

- It's about as cheap to buy a house as to rent, in today's market.

- The baby boom is continuing (births were at an all-time high of 4 million in 1954). So families need larger houses.

- More families are moving up to middle or higher income levels where they can afford new homes.

The availability of mortgage credit on liberal terms has been another key factor in the current housing boom. But there may be some tightening now. In some areas, easy credit has led to speculation by builders. Government policy is to keep mortgage credit relatively easy. But tightening up even a little bit might slow starts in 1956.

New homebuilding means more demand for schools, churches, stores and other community facilities as well. So the construction boom will still be spreading out next year even if new housing starts are down.

The copper strike is sure to mean higher copper prices. Copper remains in tight supply. And most industrial consumers will need all they can get in the next few months. So copper prices are bound to rise with wages . . . or with shortages.

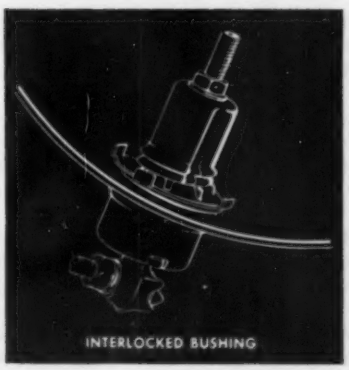
Higher prices for copper, combined with the rise of about $7.50 a ton for steel, mean higher material costs all along the line.

Still, corporate profits this year will be almost the highest ever. They may top $21 billion (after taxes) for the full year 1955, even though higher costs for labor and raw materials will narrow profit-margins in the second half year.

Consumer income—like construction and corporate profits—is reaching a new high. Total personal income was over $296 billion in May. It's headed for $300 billion by year-end. With tax-cuts a near certainty in 1956—an election year—and total income so high, you can count on consumers to continue their spending spree in 1956. With this prop to the economy, the outlook stays fine for the rest of 1955 and beyond.

M. L. Bright, Distribution Transformer Specialist, demonstrates this

FACT: Completely interlocked LV bushing preserves seal and internal clearances



All Westinghouse pole-type distribution transformers feature threaded porcelain low-voltage bushings that are secured internally by spring grip nuts to provide the best possible seal. They are also fully interlocked to prevent breaking the seal or any accidental change in internal clearances. *Connectors are suitable for copper or aluminum conductors.*

It's another of the many design advances in the complete new Westinghouse line that spell more for your transformer dollar.

• • •

Get all the time- and money-saving facts today from The Man With The Facts, your Westinghouse Sales Engineer. Or write direct to Westinghouse Electric Corporation, 3 Gateway Center, P. O. Box 868, Pittsburgh 30, Pennsylvania.

J-70743

YOU CAN BE SURE...IF IT'S

Westinghouse

Tourist at Hoover (Boulder) Dam 1955

Sightseers watch movie of construction, then take guided tour of the huge project which the Republicans call "Hoover" and the Democrats call "Boulder"

"Power is considered a by-product and is least in order of importance after flood control, irrigation and other water use."

This is what the guides at Hoover Dam are telling some half million average American tourists each year who visit this project.

The guide does not say that the dam produces cheap power making no reference to cost. He tells the group that the "prime object on the river is flood control" and that the revenues provide for repayment of principal with interest over 50 years.

There is some exaggeration when one is told that one of the 82,500 kva units will supply the domestic needs of a city of half-million people. Perhaps it would have at the time the dam was dedicated by President Roosevelt, September 1935.

The only other exaggeration that the tourist is exposed to is in the folder distributed to each person. Here one finds the statement that "Energy generated at Hoover Dam contributes to the industrial development of the Pacific Southwest. . . . During World War II the Hoover power plant was one of the nation's vital installations. Its generators supplied more than half of the energy for the war plants in southern California, southern Nevada, and Arizona."

Perhaps the record might show that this power was all being consumed for other purposes long before the addition of the war plants and much of the industrial development of the area.

The sight seeing bus from Las Vegas stops at the town of Boulder where all the group unloads to see the moving picture of the original construction. The superlatives used in describing the magnitude of the job remain the same. So the tourist is led to believe that this is still the outstanding engineering achievement of the ages. Certainly no one doubts that it was most outstanding as of 25 years ago. The moving picture is provided by the concessionaire of a gift shop with no apparent government subsidy.

As one approaches the dam a sign says Hoover (Boulder) Dam. The bus operator says "the Republicans can call it Hoover Dam and the Democrats, Boulder Dam."

Upon arrival at the dam each person buys a ticket for 30¢ and receives a folder with diagrams and statistics. The courteous and efficient guides take over from there on.

As of June 18, the water was about 130 ft below the high water mark and 65 ft below normal. The recent rains have been sufficient to stop the drawdown with power output some 30% below normal.

As a general interest item, of the 253 employees, 99 are members of the electric companies and other participating agencies.

TECHNICAL NOTES

Heat-volume relationship of a nuclear reactor is predicted at 10^5 Btu/cu ft/hr compared with 10^4 for a modern boiler. Coolant interruption cannot be tolerated even for an instant at nuclear heat rates.

Secondary capacitors are justified for low-voltage networks at the rate of a capacitor bank for every transformer.

Fluorescent lighting at 600v, 400 cps promises economical solution to higher lighting levels.

Primer coat of 24-lb, 97%-grade red-lead-linseed-oil paint on transmission towers was followed by finish coat of black modified-alkyd, linseed-oil-resin-type paint; of course wire brushing had previously removed all loose scale.

Standard of living in U. S. A. means consumption of 1,500 tons of fresh water per year per citizen.

Carbon dioxide is generally used as the inert gas to displace air or hydrogen from a generator during gas-changing operations. Objective is to avoid explosive mixtures.

Tax remission for electric water heaters and space heaters to encourage their use is contemplated in Britain as a step toward control of atmospheric contamination.

High values of pipe-to-ground voltage can develop unless adequate grounding is maintained on the terminal ends of the pipe carrying pipe-type cable.

Vacuum trip on most condensing units will shut down the turbine if vacuum falls below 20 in. of mercury. During start-up, protection is provided by a second trip point at about 10 in. of vacuum.

Equal parts of 2,4-D and 2,4,5-T make a reportedly good foilage spray and basal spray; for stump treatment the 2,4,5-T is more effective than the mixture.

Solar energy in Algiers synthesizes nitric acid from air, water, chalk, and sunshine concentrated to 3,000C. Higher temperatures in the Pyrenees fuse high-temperature ceramic materials. But conversion to mechanical energy shows little progress since ancient man made the sun open his temple doors.

FINANCE AND REGULATION

Bond Issue Sale . . .

. . . of $15 million by Tacoma may be used to finance Mayfield Dam, Judge Wright rules

The City of Tacoma, Wash., may issue the $15 million in bonds it has sold recently to finance the start of work on its Mayfield Dam on the Cowlitz River, Thurston County Superior Judge Charles Wright has ruled at Olympia, Wash.

Judge Wright modified a temporary restraining order against Tacoma City Light in connection with construction of the dam, to prevent sale of the bonds, although Tacoma bears the risk of a later adverse legal decision. A hearing on issuance of a permanent injunction against construction of the dam is set for Aug. 8 before Judge Wright.

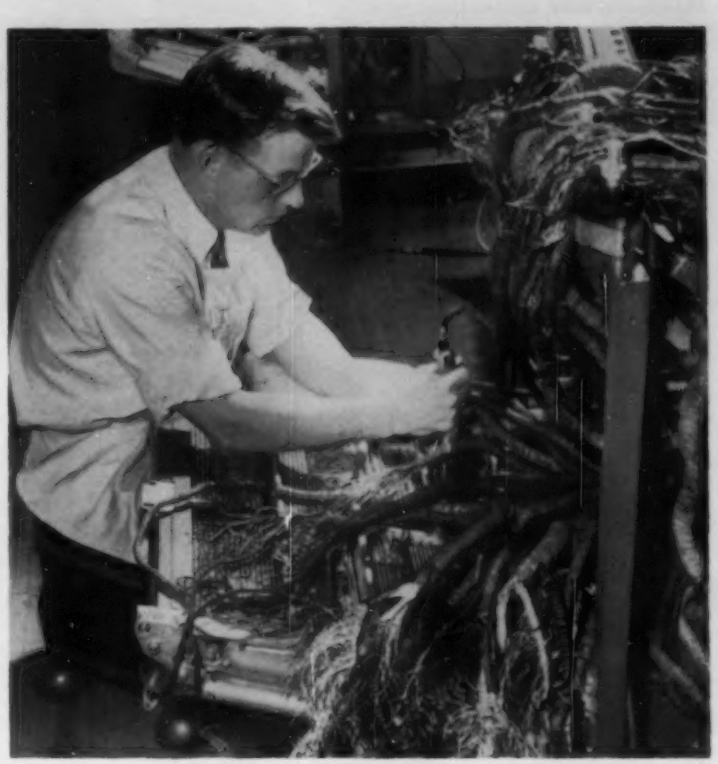
Bonds To Be Delivered By July 21 . . . The bonds must be delivered to a group of underwriters headed by Halsey, Stuart & Co—Lehman Brothers—John Nueen & Co, by July 21, according to provisions of the bond sale agreement.

Tacoma also may continue with preliminary engineering work and construction of an access road to the dam site, Judge Wright ruled. Contracts for construction of the dam and installation of generators were awarded recently.

The Washington Fisheries and Game Departments seek the injunction, contending state law has established a fish sanctuary on the river and that the city has no right to condemn state property already dedicated to a state use.

Tacoma Would Suffer Damages . . . In securing a modification of the temporary restraining order, attorneys for the City of Tacoma contended that possible damage to the extent of several million dollars would be suffered by the city if the order were kept in force until Aug. 8. Tacoma has won earlier legal battles with the state over the project.

As a result of the restraining order the Tacoma City Council has delayed authorization for installation of four generators in the Mayfield power house.



Loose Ends Are Mended

Elwood Bower of the International Business Machine Corp in Endicott, N. Y., plant is shown hooking up a spaghetti-like maze of wires into the delicate nervous system of an electric accounting machine.

Working from memory, he is guided by the colors of the individual wires in making this machine work.

Los Angeles W&P To Spend $144 Million Next Year

A budget of $193,316,000 has been adopted for the Los Angeles Water & Power Department for the next fiscal year, an increase of more than $12 million over last year's figure.

The power system's share, which includes all but a fraction of the budget increase, is $143,549,000. Main items accounting for added $12 million in power allotment are: Additional fuel purchases for stepped-up steam generation necessitated by the decrease in power from Hoover Dam; purchase of a $2 million administration building site.

$85,566,000 of the total budget has been set aside for capital investments, with biggest single expenditure nearly $23 million for steam plant construction and equipment purchases. These include work at Valley and Scattergood steam plants. Another $11 million is for construction of receiving and distributing stations at a number of locations throughout the city to handle the increased load.

Rate Plea Dismissed

Florida Railroad & Public Utilities Commission has dismissed a petition for a system-wide rate investigation of the Florida Power & Light Co on the ground it was not a bona fide complaint. In the order PUC criticized National Utility Service, Inc, New York, which it said solicited complaints from consumers "for their own selfish gains." PUC noted that 16 of original complainants withdrew and two more were not FP&L customers.

FINANCIAL BRIEFS

Manchester, Iowa, citizens vote 239 to 38 in favor of renewing a 25-year franchise for Iowa Electric Light & Power Co . . . **Duke Power Co** is now billing its residential and small commercial power customers every two months instead of every month.

New England Gas & Electric Association has sold privately $3.5 million 25-year sinking fund collateral trust 3⅝% bonds, series D, due 1980 through First Boston Corp.

Union Electric Co of Missouri has asked the Illinois Commerce Commission for approval to dissolve its wholly-owned subsidiary, Union Electric Power Co, and transfer its assets to the parent company.

Wall Street sources say that Central & South West Corp, Oklahoma Gas & Electric Co, and Illinois Power Co may soon raise their common stock dividend payments.

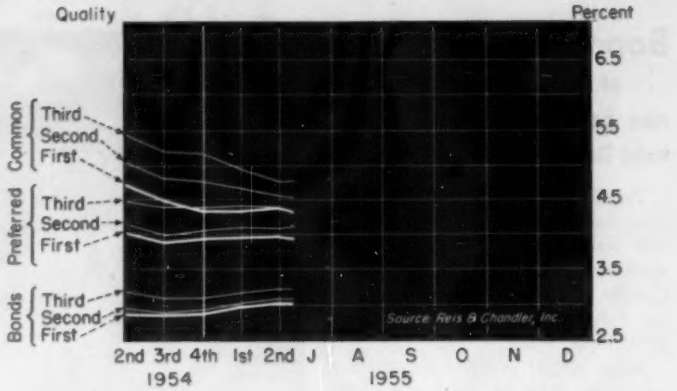
St. Joseph Light & Power Co has asked the Federal Power Commission for approval to purchase all the outstanding common stock of the Missouri Service Co of Tarkio, Mo. St. Joseph will issue 30,000 shares of its stock for the 40,000 shares outstanding of Missouri Service. This latter company supplies electricity to 13 Missouri cities and one in Iowa.

California Electric Power Co is planning to sell competitively 230,000 common shares on August 23 and $6 million first mortgage bonds on August 30. Company will pay September 1 a quarterly common stock dividend of 17½¢ a share as compared with 15¢ a share in the previous quarter.

A total of $858 million of new securities was sold by the industry to the public in the first half of 1955 as compared with $1.4 billion in the like period of 1954, a Reis & Chandler, Inc, survey reveals. Of the $858 million in 1955, new money financing totaled $730 million versus $1.1 billion in 1954.

Taxes paid by Public Utilities Districts have nearly doubled in five years, "and so have tax equivalents," declares Ken Billington, Washington PUD Association executive secretary, in association's "Power Facts."

Today's Utility Yields—(%)



	BONDS			PREFERRED STOCKS			COMMON STOCKS		
QUALITY.....	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
July 7.....	3.03	3.09	3.21	3.96	4.07	4.35	4.35	4.51	4.76
June 30.....	3.03	3.09	3.21	3.97	4.06	4.37	4.37	4.52	4.74

Utility Earnings

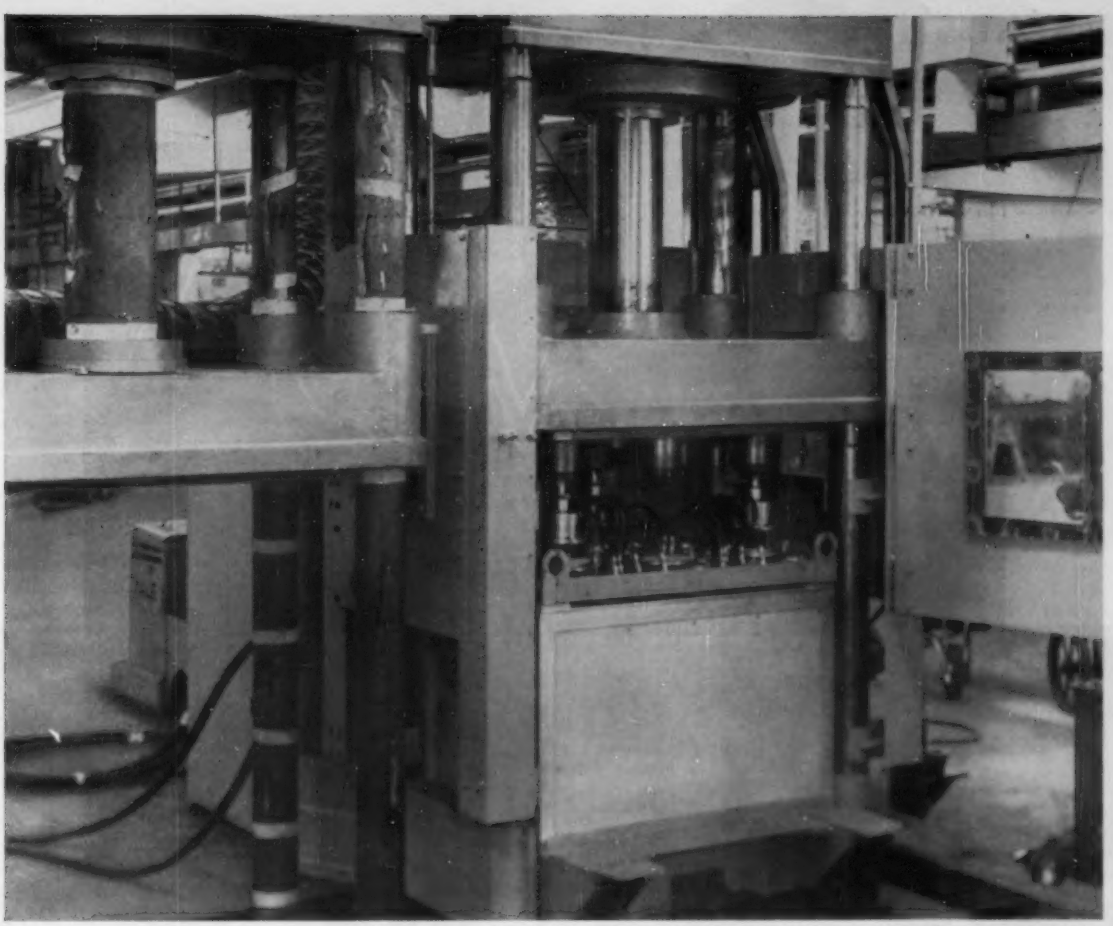
COMPANY	PERIOD MONTHS	ENDED	NET INCOME 1955	NET INCOME 1954	EARNINGS PER COMMON SHARE 1955	EARNINGS PER COMMON SHARE 1954
Arizona Public Service.....	12	May	$5,185,000	$4,173,000	$1.52(a)	$1.42(a)
Baltimore Gas & Electric.....	5	May	6,456,000	5,571,000	1.03(a)	0.93(a)
Central Maine Power.....	5	May	3,094,592	2,569,914	....	....
Gulf Power.....	12	May	2,179,665	2,164,901	....	....
Iowa Electric Light & Power...	12	May	3,557,329	2,892,119	1.91	1.63
Louisiana Power & Light.....	12	May	4,445,709	3,608,065	....	....
Mississippi Power.....	12	May	2,102,553	2,171,964	....	....
Mississippi Power & Light.....	12	May	3,936,530	4,093,257	....	....
Pennsylvania Power.....	12	May	2,714,221	2,538,040	....	....
Pennsylvania Power & Light...	12	May	20,142,644	19,053,846	2.95(b)	2.79(b)
Texas Power & Light.....	12	May	10,209,600	9,575,216	....	....
West Penn Electric, consolidated	12	May	16,463,900	15,064,389	1.94	1.78

Notes—(a) Based on average number of shares outstanding, and (b) Based on number of shares outstanding at end of period.

Utility Financing

COMPANY AND DESCRIPTION	AMOUNT OF OFFERING (000)	OFFERING PRICE	YIELD TO PUBLIC
JULY 7-13			
PREFERRED STOCK			
Northern Indiana Public Service—120,000 sh 4.22% $100 par cum.....	$12 000	$100	4.22%
SCHEDULED FOR JULY—AUGUST			
BONDS			BID DATE
Gulf States Utilities—bonds or debs.....	$10,000	.....	.....
PREFERRED STOCK			
Consumers Power—100,000 sh cum no par.....	$10,000	.....	July 2 (a)
Southern Colorado Power—20,000 sh $50 par 4.72% cum	1,000	.....	July 27(b)
COMMON STOCK			
Consumers Power—373,689 sh (to be offered common-ho'ders on 1-for-20 basis, record July 21 to expire Aug. 5; unsubscribed stock to be offered to employees).....	.....	.....	.....

Notes—(a) Morgan Stanley & Co group, underwriters, and (b) Stone & Webster Securities Corp—Paine, Webber, Jackson & Curtis, underwriters.



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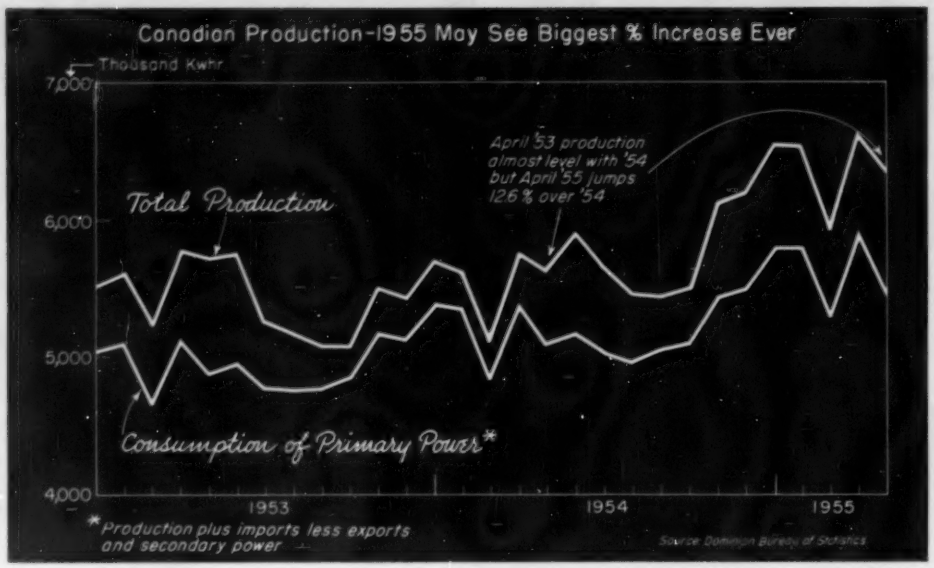
STATISTICS



Power Statistics . . .

		Latest Month	Preceding Month	Year Ago	Annual Change %
Capacity	May	106.32	105.30	93.81	13.3
Peak—Class I Systems (million kw)	Apr.	82.4	83.4	73.7	11.8
Estimated Dec. '55 Peak	Mar.	96.5	96.4	96.0	0.6
Production—billion kwhr	Apr.	42.03	44.45	36.84	14.1
hydro		10.47	10.40	9.91	5.6
fuel		31.56	34.05	26.93	17.2
Sales—billion kwhr	Apr.	39.56	39.94	34.13	15.9
residential		10.54	11.08	9.57	10.1
commercial		6.14	6.20	5.69	7.9
industrial—includes sales to AEC		20.51	20.36	16.73	22.6
other		2.37	2.29	2.12	11.6
Fuel Consumption	Apr.				
coal—million tons		10.12	11.51	8.68	16.7
oil—million barrels		5.68	6.81	4.78	18.7
gas—billion cu ft		92.82	83.41	91.10	1.9
Net Income Class A & B Co's—$ million	Apr.	105.46	107.80	95.87	10.0
Residential Customers—millions	12 mos.	43.44	43.35	42.15	3.1
revenue per kwhr	ended	2.68¢	2.65¢	2.72¢	−1.5
avg. kwhr per customer	Mar.	2,606	2,587	2,400	8.6
avg. annual bill		$69.84	$69.33	$65.28	7.0

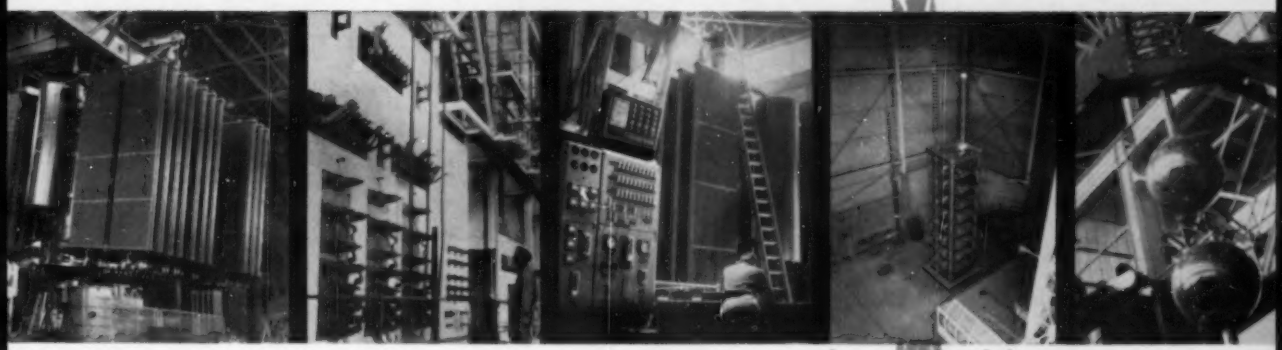
Business Statistics . . .

Indexes: 1947-49 = 100					
FRB Industrial Production	May	137	138	124	10.5
ENR Construction Cost	June	137.5	137.0	130.5	5.4
BLS Cost-of-Living	May	114.2	114.2	115.0	−0.7
NEMA Sales	May				
insulation materials		154	160	116	32.8
electric appliances		110	105	89	23.6
household refrigerators		104	96	74	40.5
Wholesale prices	May				
motors and generators		120.8	120.5	124.1	−2.7
transformers and regulators		127.3	127.3	128.1	−0.6
switchgear and fuses		135.6	135.5	135.1	0.4
GNP—annual rate—$ billion	1st Qtr.	$370.0	$362.0	$355.8	4.0

TESTING

When ordering power transformers—consideration should be given to the performance record of the manufacturer. To assure proper performance, extensive test facilities are necessary. Moloney has constantly expanded their testing facilities to maintain an enviable record of performance and reliability.

MESS-50



When you specify Moloney, you specify *proven* "Dependability at its Best."

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SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES AT ST. LOUIS, MO. AND TORONTO, CAN.

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5/8% STEP
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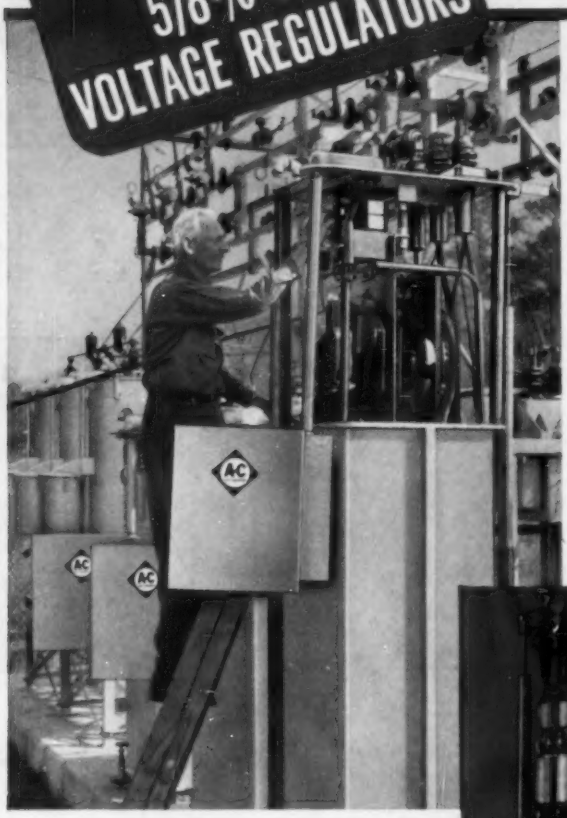
Easier to Inspect than any other



Routine inspections cost less both in time and manpower with Allis-Chalmers single-phase regulators. They are easier to inspect than any other regulator on the market. All components are cover suspended when untanking. All you do is remove a few cover bolts and control cabinet mounting bolts. Then just hoist up on the cover and the entire unit comes out of the tank. There is no oil to handle; no leads to break.

To check operation, just attach an external power source to the control leads. The regulator operates in normal fashion outside the tank as well as inside. There are no special connections to make.

Conveniences like these are the natural result of step regulator experience. No other manufacturer can match Allis-Chalmers 20 years of 5/8% step regulator experience. And no other 5/8% step regulator offers you so many years of solid proof of utility satisfaction.

For more information, consult the A-C office nearest you or write Allis-Chalmers, Milwaukee 1, Wisconsin. A-4769

It's easy to untank an Allis-Chalmers single-phase regulator with a truck crane, block and tackle, or with this more convenient inspection jack. Designed to help you take advantage of Allis-Chalmers unique cover-suspension feature, this jack can be used either on distribution regulators or single-phase power regulators. Jacks are available—see your nearby Allis-Chalmers office.

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